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THE NEW FARMER'S MANUAL

REVISED EDITION

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GENERAL AGRICULTURE.

CANADA'S GREATEST INDUSTRY.

More than half the people of Canada live on farms, supporting themselves directly from the products of the soil. For the year 1917 the total acreage devoted to field crops was estimated by the Census and Statistics Office to be 42,602,288. furnishing foodstuff to the value of $1,144 536,450. To this should be added a considerable area of pasture land, improved and unimproved, which provides sustenance for live stock. Saskatchewan leads in the value of field crops with $350,000,000, and Ontario second with $251,000,000 for the year 1917.

Wheat takes the leading place among the grain crops, giving a return of $453,038,600 in 1917; oats follow in second place with $277,065,300, and barley third with $59,654,400. Fodder crops of 1917 were estimated to be worth $187,505,900.

Estimates of farm live stock in Canada in 1917 were as follows: Horses 3,412,749, valued at $429,123,000; cattle 7,920,940, valued at $544,676,000; sheep 2,369,358, valued at $35,576,000; and swine 3,619,382, valued at $92,886,000

The average value of farm land in Canada, including improved and unimproved together with the buildings, is approximately $44 per acre. By provinces the averages are: Prince Edward Island, $43; Nova Scotia, $33; New Brunswick, $28; Quebec, $53; Ontario, $52; Manitoba, $31; Saskatchewan, $26; Alberta, $26 and British Columbia $149. In the last named province the higher average is due to fruit growing. In parts of Ontario, Quebec and Nova Scotia, high values are attained by reason of adoption of land to special crops as peaches, apples, sugar beets or beans.

The Dominion Government maintains eighteen experimental farms and stations for the purpose of testing new varieties of crops and methods of cultivation. The Central Farm at Ottawa was established in 1886.

PLANNING THE HOMESTEAD.

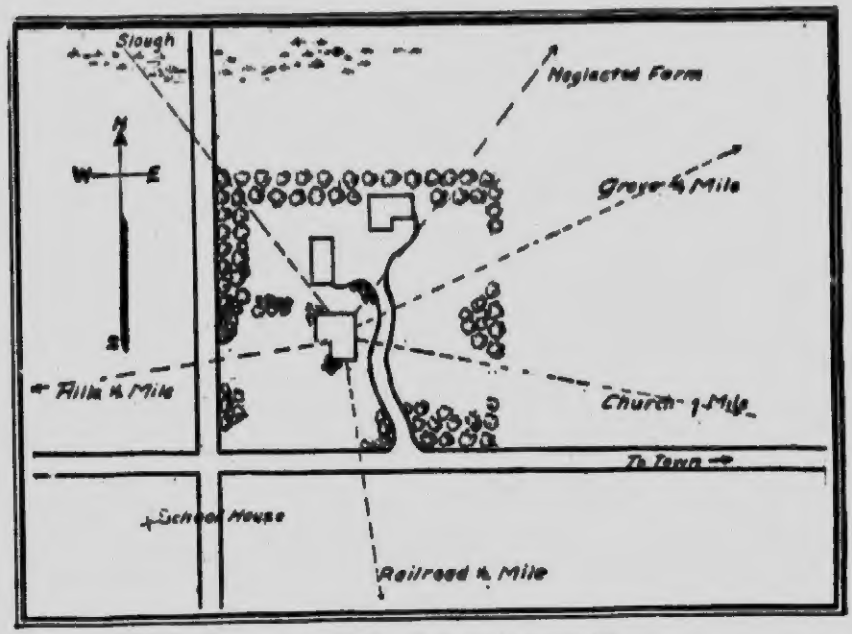
Laying out a farmstead is like naming a baby. Once done it's done; it is a lot of trouble to change it. Hence the wisdom of acting with wisdom in the initiative—in other words, at the birth of the farm.

Nature must be taken as one finds her. The farm to be dealt with may be level or hilly. It may be wooded or bare. It may have water running across it, or it may be without even a well. The man who becomes the first settler on it may require some advice as to how to proceed. In a general way the following suggestions are offered:—

The dwelling-house should be near enough to a main road to be convenient without the annoyance of flying dust, noisy vehicles, objectionable smells, and the visits of "tramps" It should be on a slight elevation and so situated as to make drainage from a good cellar feasible. If the ground slopes up from the house to a good natural spring, this will be of perennial satisfaction, giving a domestic water supply by gravity. Failing this, it is well to locate a good well before turning the first sod for excavation. Let the well be near enough to the dwelling to be under cover and enable water to be drawn without going out of the house. If there are trees on the site, study their relation to the house as regards shade, ornamentation, shelter from storm, dampness, insects, etc. If

there are no trees, keep in mind the fact that some will be required, and the services or advice of a landscape architect or expert nurseryman will be well repaid in laying out the tree scheme. In this regard keep an unobstructed view to the main road; also vistas looking towards churches, schools, neighbors' houses, town, attractive scenery, etc. A 1½ or two storey house with a good cellar will meet the requirements of most farm families.

The barns and stables should be far enough from the house that fire will not be communicable from one to the other, as prevailing winds will be from the southwest, especially in summer; the outbuildings should be to the northwest, north or east of the residence so that the latter will escape barnyard odors as much as possible. Large buildings are more convenient and economical than small, separated buildings. "All under one roof" is the motto of many farmers, but the risk from fire is greater in proportion to the value of the contents. If machinery can be kept in one section, stock in another and grain in another, there is a chance of saving something from a fire, but many prefer convenience



HOMESTEAD WITH SHELTER BELT

and labor-saving arrangements and trust to fire insurance to save them from ruin. Care must be taken to see that drainage from the barnyard is not towards the house; also that it will not contaminate the water supply intended for the stock.

If the shelter which ornamental trees can afford is desired, the design might permit of their embellishing the driveway up to the dwelling-house. Certain fruit trees might be interspersed here to advantage, as they would have partial shelter themselves as well as sunlight, and the daily oversight of the family. The fruit and vegetable gardens should be convenient to the house, and in many instances can be laid out adjoining. Suitable land for the purpose, however, is more important than location.

Woods or orchard make a good background for farmhouse and buildings. In cold climates, woods or, at least trees, to form a windbreak for the orchard

and garden, will be a great advantage. Stock also will benefit by such an arrangement in the winter. Roads on a farm should be good, and if possible straight. Saving steps is a prime consideration in connection with farming operations, and meandering roads and pathways that relieve monotony in the city are out of place in the country. The artistic, or at least the pleasing and even attractive, can be secured without tortuous embellishments. Beauty and symmetry add more than sentimental value to country property, so that a proper idea of proportion as to size of buildings and relative location is of considerable monetary importance as well as of æsthetic value.

THE FARM SHELTER BELT.

The farm shelter belt consists of tree protection, either natural or artificial, and is required particularly in level or prairie territory. The object is to protect gardens, orchards, chickens and general farm stock from the cold winds that sweep across vast open areas. It is also of advantage in holding back snow, drifts in some localities, and, moreover as a background for buildings, can be made to improve the appearance of the farm surroundings. No detailed instructions can suit all groups of buildings, tastes of proprietors or requirements of varied conditions, but certain general principles should govern the arrangement of such a scheme.

The tree belt should be kept well back from the buildings. Otherwise snowdrifts will be too deep around the barnyard—one of the things the belt, properly situated, should minimise. This objection will not apply to the few shade or ornamental trees which may be planted quite near to the house. One must study the direction of the prevailing winds in the locality, as this is the principal element in the entire project. Some would completely surround house and buildings, but this is not always possible or desirable. As a rule tree belts should not be planted within a hundred feet of the out-buildings—though medium-sized trees, such as evergreens, may sometimes occupy space between dwelling and farm buildings and hide some unattractive objects as well as afford protection from wind that passes through or under the taller trees farther back. No tree belt should be wider than six or ten rows. In many instances four will be sufficient.

Hedges are very desirable as immediate enclosures for gardens, lawns, etc. Maple, ash, elm, willow and poplar are among those most favored. Mixed varieties are advised under some circumstances when the scheme is to be artificially carried out and choice is permissible. For the prairies, experts declare it is not advisable to use Russian poplar or cottonwood alone. They may give satisfaction for eight or ten years, but not permanently. For inside hedges the Caragana is highly recommended for prairie conditions. It is easily secured, hardy and rapid in growth, stands close clipping and can be trained to any height from four to sixteen feet. Evergreens are strongly recommended both for shelter and ornament, such as the Jack pine, Lodge pole pine, Scotch pine and native white pine. Pine and spruce mix well for shelter purposes, and are highly ornamental at the same time. The pines will not stand very close trimming, and should not be used in single rows, as the later growth is somewhat loose and straggling, and the lower branches usually die off as the tree gets old.

Work and common sense are necessary to keep the trees in condition. If neglected they can become anything but ornamental. Before planting, the ground must be properly prepared, and the native couch grass, Brome grass, Kentucky blue grass and sweet grasses must be killed. They are the enemies of the tree planter, and they must be kept away from the plantation permanently.

Liberal space between the tree belt and fences is desirable, and such space should be kept free from noxious weeds, etc. The shelter belt itself should be kept free from bad grasses and weeds, if possible.

ALFALFA GROWING.

TOP OF ALFALFA PLANT; ALSO SEED PODS AND SEED MAGNIFIED.

Among forage crops, alfalfa stands at the head for good yields combined with high quality for feeding. It can be grown to advantage under a diversity of soil and climatic conditions, and has, generally speaking, a wider geographical range of usefulness in Canada than any other forage crop. Alfalfa is a choice food for all kinds of farm animals and produces more economical feed per acre than does any other hay or pasture crop. It, furthermore, requires comparatively little labor. Once well established, it continues to yield heavy returns. On account of its lasting character, a good deal of money and labor is saved annually, as no re-seeding is necessary for years.

Spring seeding is best when everything is taken into consideration. Early oats, barley, spring wheat and winter wheat make good nurse crops. Late oats is a poor nurse crop. Fifteen pounds per acre is the rate of seeding usually recommended, though more can be used on light soils. The land ought to be double disced before the grain is put in, followed by a harrowing. It is desirable, though not essential, that the small grain be drilled in preference to broadcasted, as the drilled grain permits more light to get at the little alfalfa plants.

The alfalfa should be sown after the grain is drilled, not with it. One very good method is to sow the alfalfa seed and follow with the corrugated roller. This compacts the soil around the alfalfa and covers it sufficiently. Alfalfa seed should not be covered too deep. If mixed with the grain and drilled in, it will go in too deep.

It is of first importance that land be well drained either naturally or by tiling. Also there must be sufficient lime in the soil. Most fields that have been cropped for a number of years will be benefitted by the application of lime and more assurance given of a catch with alfalfa. Quick lime, slaked lime or ground limestone are all satisfactory. Only the hardier varieties will stand the winter in Canada. Grimm's, or variegated, have given best results at the experimental farms.

If alfalfa or sweet clover have not been grown previously on the land, it is necessary to inoculate with soil from an inoculated alfalfa field or a vigorous sweet clover patch. Dry the dirt without exposing it to the sun, and pulverize and sift it. Dampen the alfalfa seed with a solution made by dissolving one pound of glue in three gallons of water. Sift the dirt over the seed at the rate of about a quart of dirt to a bushel of seed. Shovel the seed over until it is well mixed with the dirt. Another method is to obtain a bottle of culture from the nearest agiricultural college.

WEIGHT TO SEED AN ACRE.

It is impossible to state definite quantities as the proper seeding for an acre of land. Moisture supply, plant food, soil preparation, seed quality, etc., must be considered. Relatively larger quantities should be used (a) on heavy soils, (b) on fields such as fallow with a liberal moisture supply, (c) on areas subject to early frosts, (d) when the seed used is above the average in size and therefore relatively fewer to the bushel, and (e) when germination percentage is low. Thinly seeded fields withstand the most drouth, but thick seeding matures earlier. Following are safe minimum and maximum quantities:

Crop.	Weight to seed an acre.	Weight per bus.
Red Clover	8 to 12 lbs.	60 lbs.
Alfalfa	10 to 18 lbs.	60 lbs.
Alsike Clover	4 to 8 lbs.	60 lbs.
White Clover	4 to 6 lbs.	60 lbs.
Timothy	4 to 8 lbs.	48 lbs.
Blue Grass	12 to 18 lbs.	14 lbs.
Red Top (without chaff)	8 to 12 lbs.	.. lbs.
Red Top (with chaff)	15 to 20 lbs.	.. lbs.
Western Rye Grass	10 to 15 lbs.	14 lbs.
Brome Grass	10 to 15 lbs.	14 lbs.
Permanent Mixture:		
Alfalfa	4 to 5 lbs.	
Brome Grass	7 to 8 lbs.	
Western Rye Grass	3 to 5 lbs.	
Millet	15 to 25 lbs.	50 lbs.
Rape (in drills)	2 to 4 lbs.	60 lbs.
Rape (broadcast)	4 to 6 lbs.	
Corn (in drills)	24 to 32 lbs.	56 lbs.
Corn (in hills)	10 to 16 lbs.	
Buckwheat	30 to 40 lbs.	48 lbs.
Flax	20 to 36 lbs.	56 lbs.
Rye (Winter)	45 to 56 lbs.	56 lbs.
Rye (Spring)	56 to 70 lbs.	
Peas	120 to 180 lbs.	60 lbs.
Barley	75 to 120 lbs.	60 lbs.
Oats	68 to 105 lbs.	34 lbs.
Wheat	60 to 105 lbs.	60 lbs.
Sugar Beet	4 to 6 lbs.	
Carrots	2 to 3 lbs.	
Mangels (in drills)	4 to 6 lbs.	
Potatoes	8 to 12 bush.	
Swede turnips	2 to 2¼ lbs.	

WHEAT VARIETIES FOR THE WEST.

Prof. Bracken, of the University of Saskatchewan, gives the following descriptions of the leading varieties as tested on the farm at Saskatoon.

Marquis—High yield, excellent quality and medium early. Straw—Medium long, strong, and somewhat resistant to rust. Recommended for heavy soils and fallowed lands in the more moist regions where fall frosts are feared and where a rather short straw is preferred.

Red Fife—High yield, excellent quality, late in maturing. Straw—Long, strong and somewhat rust resistant. Recommended for the lighter and earlier types of soil, for the dryer parts of the province and for all regions where fall frosts are not feared and where long straw is desired.

White Fife—High in yield, but rather late in maturing. This variety is in disfavor owing to the color of the bran.

Pioneer—Medium yield, high quality, very early. Recommended for all regions where Marquis does not mature, where earliness and a fair length of straw is desired, and where a weak straw is not a serious objection.

Prelude—Very light yield; excellent quality; very early in maturing. Recommended for regions north of the present wheat-growing area. On account of its low yield it is not worthy of a place where Marquis matures.

Alaska—Medium yield; very poor quality; medium early. This wheat is less productive; much inferior in quality and rather later in maturing than standard sorts, such as Marquis and Red Fife. Its merits have been much overrated by interested individuals and small quantities of seed have been sold at fabulous prices.

Kubanka—A Macaroni or Durum Wheat—High yield; good quality; rather late in maturing. Straw— Long, flexible and slender, quite resistant to rust. Recommended for trial only in Southern and South Western Saskatchewan. Judged by our present standard is not considered a suitable "bread" wheat.

SLOUGH GRASSES.

Many slough grasses make valuable hay, especially in the prairie provinces. Western farmers might with profit pay more attention to slough grasses, growing as they do, where grain cannot be sown.

Among the more important of these is White Grass or Thatch Grass. This is a tall grass, which grows in the middle of sloughs where the water is deepest It is coarse but makes valuable feed, being both nutritious and palatable to stock of all kinds. In parts of British Columbia it is known as Sugar Cane Grass.

Where the water becomes shallower towards the edge of the slough is a coarse sedge, known in some places as Sweet Sedge or Awned Sedge. This grows in sweet water and is one of the best indications of good water. It makes excellent feed. With or outside this, towards the edge of the slough are two valuable Blue-joint Grasses, the Canada Blue-Joint and the Upright Reed-Grass. Both of these produce the very best quality of hay.

GRASSES FOR THE WEST.

The two grasses of greatest value in the West are awnless brome grass and western rye grass. The former of these produces a large amount of feed of highest quality, both as hay and as pasture. It comes early in spring and can be fed later than almost any other grass. Being a deep-rooted perennial, it is rather hard to get out of land when it is required for other crops, but there is

no real difficulty in this if the sod is broken and back set in the old-fashioned way, the same as with the virgin prairie. This grass is also of very great value in districts where land is liable to blow, as it puts fibre into the soil and keeps up its fertility. The western rye grass is an excellent hay grass, but gives less pasture than awnless brome. It also is a perennial, but, unlike the brome, is a bunch grass and has no running root stocks. The difficulty of getting brome out of the land has recently been unduly magnified, but for the western provinces the only solution of the difficulty of securing large quantities of first-class hay and pasture rests with the cultivation of this extremely valuable grass. A very valuable hay may be secured by sowing about six pounds of awnless brome grass seed and ten pounds of alfalfa to the acre. Such a meadow would last for six or seven years and would give two crops of hay each summer.

HAY AND PASTURE GRASSES.

For many years timothy has maintained its popularity for both hay and pasture. It is easily cured, bears handling well, and is always in good demand on the market—for these reasons it is likely to continue as one of the standard grasses. The bulk of the timothy plants, however, do not withstand grazing as well as some other grasses, but there are many individual plants eminently adapted for pastures; these possess creeping root stocks, like quack grass or Kentucky blue, and thus have two means of multiplication, by means of stolons or underground stems and by seed.

Redtop is one of the common pasture grasses on thin upland pastures. It is a general purpose grass. It can be cut for hay or grazed. It will grow on low, wet land, and will fight bravely for existence on thin, upland soil. It is not readily eaten by stock if there are better grasses in the pasture, but if no better grasses can be grown it should be sown. A pound of seed contains between 6,000,000 and 7,000,000 seeds and costs from 20 to 25 cents. It may be sown on low-lying land if nothing better is available. It comes into bloom a little later than timothy, but can be sown with it for hay.

REDTOP GRASS

Orchard grass is an excellent hay plant on good loam soil. Unlike timothy, it must be mown for hay as soon as ready. It matures earlier than timothy,

and will bring the haying in June. Too large an area should nnot be sow on any farm, but there are sections where it is worthy of extension. The grass starts early in the season and is readily eaten by all stock until June, when it begins to get stemmy. Sheep and horses are rather more partial to it than cattle, and it is worth while trying to have a small field of it on every sheep farm. During May and June it furnishes excellent food for the ewes and lambs, and they graze it sufficiently close to tend to reduce its bunched appearance. It grows in tufts, and will hold its own in shady places. Wherever there are late spring frosts it will not make much headway, being particularly susceptible to frost injury. A light manuring with straw or chaff in fall or winter will frequently save it from such injury. The seed is large, and there are about 500,000 to 600,000 to the pound, which costs from 18 to 20 cents. It requires ten pounds of orchard grass seed to furnish as many plants as one pound of redtop. At least thirty pounds of seed are required to the acre if sown alone, so that the seeding for an acre will cost between $5 and $6.

ORCHARD GRASS

Meadow fescue is one of the most highly esteemed of all permanent pasture and meadow grasses. It is relished by all stock. It is of little value for temporary seeding, since it takes about three years for the plants to get well established. It is rather particular in its soil requirements. It is not a poor land grass; it wants the soil to be in good condition, fairly rich in organic matter, and it does best on loam soils which have an adequate supply of moisture throughout the season.

Meadow foxtail is much relished by cattle. It grows at its best on damp, rich black clay or clay loam soils. Under such conditions is has maintained itself in a permanent pasture for nearly twenty years. It is well worthy of trial under such conditions. It blooms from May to August, and is not therefore a good hay plant. Since the seed ripens very unevenly in the head, it is seldom possible to secure a sample in which more than 40 to 50 per cent. of the seed will germinate, and 20 per cent. is much more common. Owing to the expense it is not advisable to sow this grass alone. It takes about three years to become established, and is of no use except as for permanent grass land. For pasture it may be sown with timothy, alsike clover, bluegrass and white clover, the idea being that the whole will be mown for the first two years and subsequenlty grazed.

June grass, or Kentucky bluegrass, is generally regarded as the pasture

grass of America, yet in many parts it is not much relished by stock. Wherever the grass does not grow luxuriantly, where the leaf tends to curl up into a bristle and not lie broad and succulent, it may be of questionable value. There is much variation among the plants; some are sought out by the cattle, others are neglected. It would seem that those plants bearing leaves with markedly serrated edges, bristle shaped, which die at the top, are neglected, while the desirable ones are usually prevented from seeding, owing to their consumption by the stock.

MEADOW FESCUE GRASS

CORN AND ITS CULTURE.

Late summer and early fall is the proper time to begin the preparation of land for the corn crop. Best results cannot be expected when the land is left untouched until a few days before planting. If grass or weeds are troublesome, they can be most cheaply exterminated by early fall cultivation.

It is good practice to have corn follow clover. Clover adds to the nitrogen content of the soil, draws up the mineral elements required for its growth from great depths, and, in decaying, leaves these elements near the surface. Its

deep-feeding roots open up the subsoil so that the air and water can readily enter. When the clover sod is turned under the roots, add to the supply of humus, and, in the process of decay, bring about that warm, mellow, physical condition of the soil in which the roots of the corn plants delight. The corn roots follow the channels formed by the decaying clover roots and are thus enabled to develop a vigorous and extensive root system early in the season.

From sixteen to twenty tons of farmyard manure per acre is the usual dressing for corn. This manure may be applied in the fall and turned under lightly, or be put on during the winter and ploughed under shallow in the spring with a twin plough. This incorporates it thoroughly with the soil and facilitates later cultivations.

To destroy weeds, and to conserve the soil moisture resulting from the melted snow and early spring rains, the land should be harrowed after every rain, as soon as the condition of the ground will permit. These cultivations should be continued until the time of planting, when the land should receive one or two deep stirrings with the cultivator. This thoroughly pulverizes the soil, and, by opening it up to the sun and air, aids materially in making a warm, mellow seed bed.

For the main crop it is never good practice to push the season. If the ground is cold, occasional diskings will aid greatly in warming it, but it always pays well to wait until the ground is thoroughly warmed before planting.

Corn for the silo may be planted either in hills or in drills. Quantity and quality considered, hills are to be preferred. For the larger varieties the hills should be 43 inches apart each way; for the smaller varieties, 36 inches will be found a satisfactory distance. Three stalks per hill is considered a perfect stand. Corn for grain should always be check-rowed.

On warm, loamy soils corn may safely be planted at a greater depth than on heavy clay soils with a cold, stiff subsoil. When moisture is abundant, best results will generally be obtained on heavy soils if the seed is covered from one inch to an inch and a half in depth; on light, loamy clays or sandy soils, the seed will germinate more uniformly if planted about two inches deep.

The number of varieties of corn grown is very large, so large, in fact, that it has become a detriment rather than a help in corn culture. Fortunately, a few well-known varieties, the reputation of which is based upon their actual value to the farmer, are generally procurable. Among dents, Early Leaming and White Cap Yellow Dent are excellent varieties for ensilage. Mastodon and Red Cob are two well-known corns which are very popular with growers whose first consideration is tonnage. They are, however, too late and sappy to form the main part of the crop.

Of the numerous varieties of flints, it is doubtful if a better balanced corn than Longfellow is obtainable. North Dakota, Wisconsin No. 7, King Phillip and Compton's Early are close competitors. Compton's, however, is rather late in some localities. The Sanford is highly regarded by many. It is a very heavy yielder, but is inclined to be late owing to its habit of excessive suckering.

Whenever a considerable acreage of ensilage corn is being planted, it will be found good practice to put in three varieties—an early, a medium and a fairly late-maturing sort. Longfellow, Early Leaming and Mastodon lend themselves well for this purpose. These corns, however, should not be mixed until put into the silo. Each should be planted separately, and in the proportion the length of growing season would indicate. By following this practice the chances of producing ensilage of very inferior quality in an unfavorable season is minimized; while, in a good year, quality, with a heavy tonnage, is assured.

CARE OF SEED CORN.

If the corn is cut and shocked, of that portion of the field from which seed corn is to be selected should be husked before freezing occurs, and the best ears selected and kept separate. The seed corn selected should be placed in a dry, well-ventilated room where the ears can be spread out. They should not be piled in a heap, as it is important to expose them to a free circulation of air, so that they will dry quickly and thoroughly without moulding. It is a good practice, often followed, to leave a few husks attached to each ear, so that the ears may be tied together in pairs by means of the husks and then hung over poles or wires in the upper part of the room. If convenient, racks can be made like book-cases, with slat shelves about four or five inches apart, and open backs and fronts, in which the ears can be arranged until thoroughly dried. Only one row of ears should be placed on each shelf. This method allows the preservation of a large amount of seed corn in a small space.

It has been found to be very important to dry out the seed corn quickly and thoroughly, and the use of some artificial heat is in most cases desirable. It is thus important, especially in damp, cold seasons, to place the seed corn in a room where there is a stove in which a fire can be maintained at least a portion of each day for about two weeks, or until the corn is thoroughly dried out. In favorable dry autumns artificial heat may not be necessary, but in many cases the "kiln-drying" of seed, as it is called, will be found to be very important. In one experiment, kiln-dried seed gave an average yield of sixteen bushels per acre more than ordinary air-dried seed of the same variety grown in the same place. The experimental field in this case contained about ten acres, and was planted with the air-dried and kiln-dried seed in alternate rows.

In making the selection, the grower should carefully examine each ear, selecting those having deep and well-formed kernels, which will give the greatest weight of shelled corn per ear. The imperfect kernels at the tips and butts of these selected ears should be shelled off and discarded before the ears are finally shelled for planting.

O. P. V. SILAGE MIXTURE.

In parts of the country where fodder corn cannot be grown successfully, other crops such as clover and oats are utilized for putting in the silo. Good results have been obtained in the Maritime provinces and northern Ontario, by sowing a mixture of 2 bushels of oats, ¾ bushel of peas and 1-3 bushel of common vetch seed per acre. These grains are mixed together and all sown at once through the grain seeder, which is set to sow about 3½ bushels of oats per acre. Sow it early in the spring, as it is difficult to get a good crop of oats and peas if sown late, as they will not do well in the hot dry weather. It should be sown as early in the spring as the land can be made ready. It is ready to cut about the first week in August in Nova Scotia, when sown the last week in April. It should be cut before the straw begins to turn yellow and the oats are just about ready to enter the dough stage. If left till later the bulkiness of the hollow stalks will cause it to mould. If cut early it will he heavy enough and damp enough to settle down solidly so that it will keep all right. There is no difficulty in packing it tightly enough to make it keep even when the silo is filled in the hot weather of August. It should be well distributed and well packed as the silo is being filled. There is a great saving in labor by growing this material over growing corn, as it does not need to be touched from the time the seed is drilled into the ground in the early spring until it is ready to cut in August.

It should be put through an ensilage cutter in the same way that corn is handled for silage. The soil should be in good condition and fairly rich or a large crop will not be obtained. The average crop obtained at the Agricultural College at Truro the past four years is a little less than 10 tons of green feed per acre. The analysis of this material in comparison with unripe corn is given below.

	Corn Silage	O. P. V. Silage
Water	84.12	75.45
Protein	1.68	2.39
Fat	.56	.98
Ash	1.20	1.32
Carbohydrates	12.47	19.36

The cows eat it readily and seem to do just as well as on the corn silage.

BEAN GROWING.

Beans do their best on land that is decidedly rich and loamy. And the better the land, the more satisfactory will the bean returns be. Clover sod that has been well manured and plowed late in the fall makes ideal soil for the best crop.

If the field devoted to the bean crop is one that requires cleaning, it is best to disk or to cultivate otherwise as early in the spring as the land may be wrought, in order that weed seeds may be germinated as quickly as possible. As the beans are not to be sown till the first week in June, nearly all the spring and summer weeds may be destroyed wholesale before the beans are sown. When the soil has been well prepared and is warm and kindly, the beans may be sown with the ordinary grain drill set to sow the beans in drills twenty-eight inches apart and at the rate of three pecks to the acre. In the sowing, pains must be taken to cover the beans, but not to cover them at all deeply.

The cultivation of the bean crop is very similar to that of the corn crop. The same sort of cultivator will do the work. With beans it is imperative that they never should be cultivated when they are wet with dew or rain. This rule never should be departed from. Indeed, from ten a.m. to four p.m. are the ideal hours for working among the beans. When the sun is shining hot at noon, the beans may be given a stroke of the weeder, provided the plants are not more than an inch or so above the ground. Further, in cultivating this crop care must be observed in not cultivating deep near the plants. Surface working is the rule.

When more than an acre of this crop is grown it is business to purchase a bean harvester. The beans should be harvested as far as physical condition under much the same condition as peas. The bean should be dry and hard. After the bean has been pulled by the puller, large growers use the side-delivery horse rake for gathering into windrows. Throughout the beans should be harvested gently in order to prevent loss from shelling. Once harvested, they may be threshed either by the flail or by the bean thresher.

SWEET CLOVER.

Sweet clover seems to have no particular choice of soil. It will grow on very wet or very dry soil. It is, however, a lime-loving plant and does best when lime is abundant. In seeding the most essential thing is to have the seed bed thoroughly compacted with just sufficient loose soil on top to allow of the

seed being properly covered. It may be sown in the spring alone or along with a nurse crop, or in late summer or early fall like alfalfa. Of the hulled seed about 15 to 20 or more pounds per acre should be used, and of the unhulled seed about five pounds more. A generous application of seed is advisable because the hard seed coats may prevent germination. When a nurse crop is used, the latter should not be sown thickly—say, about one bushel to the acre. The question has been asked, "Is harrowing and rolling necessary after sowing? The rolling, when necessary, will be for the purpose of firming the seed bed, and the need for it will vary with conditions. It should, however, precede the harrowing, as the cultivated surface left by the harrows will prevent high winds from uncovering the seed and conserve moisture, two advantages that would be greatly curtailed if the smooth surface left by the roller is left.

When it is desired to pasture sweet clover, it must not be allowed to get too far advanced or it becomes too coarse and fibrous to be relished. Moderate pasturing after it has reached a height of six or eight inches is beneficial, but do not allow the stock to pasture it close to the ground or your stand is gone for good.

For the production of seed, either the first or the second crop may be allowed to mature. It is perhaps more economical to take the first cutting off for hay and allow the second crop to ripen for seed.

BENEFITS OF DRAINAGE.

Drainage deepens the soil. Only that portion of the soil is accessible to the roots of most of our valuable plants which lies above the water-table. If the average depth of the water-table below the surface of ground during growing season is two feet, the total mass of soil through which the roots extend, and on which they can feed, is only one-half as great as it would be if the average level of the water-table were four feet below the surface. Reducing the level of the water-table, in one sense, therefore, enlarges the farm. The lower soil is not so rich as that nearer the surface, but its contribution to plant growth is important. The roots of most of our common crops penetrate far more deeply than is generally supposed, and there are few, if any, among the common cultivated crops that will not send roots to a depth of four feet, provided soil conditions are favorable.

Drainage admits air into the soil. The action of the oxygen of the air upon the various soil constituents is favorable in several important directions. It promotes oxidation, and gradually renders soluble and available numerous soil compounds which, but for this action, must remain inaccessible to the growing crop. Only in well aerated soil do the organisms whose activity is essential to the formation of soil nitrates flourish. Well aerated soils are favorable to the multiplication and activity of numerous other beneficial micro-organisms whose activity increases the productive capacity.

The average temperature of the soil through the growing season is raised by drainage, and the growing season itself is thus practically lengthened.

Better tillage becomes possible. Wet soil never works well.

The probability of injury to growing crops in periods of drouth is reduced. This appears to be due to the greater range of plant roots, and to the physical condition of the soil being improved, so that its capillary powers are increased.

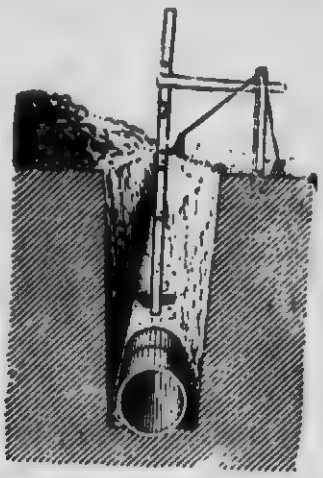
Seeds germinate more certainly and perfectly.

Surface washing is lessened. Water is free to enter the soil, instead of running off over the surface.

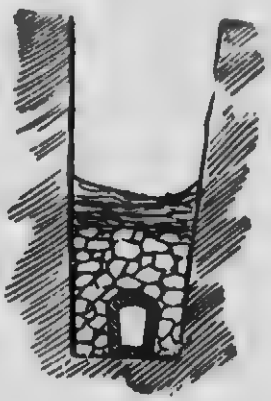
TILE DRAINS.

Tile drainage requires skilful work to obtain, first, an even grade along the bottom of the trench and, afterwards, to joint the tiles together. A preliminary survey will show, if sufficient fall can be obtained to carry away the water. The illustration shows how a line is stretched tightly between stakes alongside the open trench and the correct level obtained for the bed of the drain on which the tiles are laid.

A four-inch tile should be used for greater distances than forty rods, and other sizes in proportion—that is, in ordinary ground. As a general rule, the



GRADING WITH LINE AND GUAGE



STONES PLACED AROUND TILE TO INCREASE THE DRAINAGE CAPACITY.

branches or feeders should not average below, or over, three feet in depth, wherever possible. Mains should generally be covered by three feet of earth. In the selection of the tile, be sure to get those that are free from lime or chalk stones, for the reason that when these become wet the lime will dissolve and thus burst or chip the tile. A medium-burnt tile is generally considered best as it is more durable than either soft or hard-burnt tile and stands the handling, such as hauling and laying better.

Where big sloughs are drained and the water is shed very rapidly, a good plan is to cover the tile in several places with broken tile or very coarse gravel, so that the water may enter them more rapidly and thus sometimes save the soils from being washed away in heavy rains.

CARE OF BARNYARD MANURE.

The best place for barnyard manure is in the ground; the next best place is on the ground. Leaving it in the barnyard or in a loose heap may mean a loss of 50 per cent. or over of its fertilizing value. These losses may be from two causes, fire-fanging or excessive fermentation and from leaching. It is well to remember that liquid manure is worth four or five times what the solid portion is, and hence the desirability of retaining it by a sufficiency of litter and of subsequently preventing its loss before the manure gets into the soil. It is very rich in potash and nitrogen, two of the most costly elements of plant food. Fire-fanging means loss of nitrogen and also a destruction of the organic matter.

This latter constituent is a characteristic of farmyard manures and gives them an agricultural value not possessed by the commercial fertilizers. Carefully-rotted manure undoubtedly is concentrated manure, but the concentration cannot be obtained without some loss. Carelessly kept, i.e., allowed to heat excessively or subjected to rain, means tremendous losses. Moist, compact heaps, not too large, probably is the best plan if it is to be rotted, but assuredly the farmer who gets his manure while still fresh into the soil follows the best practice. Experiment shows that there is practically no loss when fresh manure spread on level ground dries out, but it is nevertheless best to incorporate the manure while still fresh and moist with the soil. As a rule it is not desirable to plough the manure under deeply; the disc-harrow, if the soil is in fair tilth, makes an excellent implement for working manure into the land.

SAVING LIQUID MANURE.

The old-fashioned cistern receptacle for liquid manure is becoming very unpopular, because of the labour it involves in pumping out and hauling, and also the loss of manurial constituents through fermentation. A much better plan is to have a concrete floor in the stables with gutters behind the animals to catch both the liquid and solid excreta. With these some absorbent material, such as cut straw or dried peat, should be used. Many farmers wheel the manure and soiled litter from the horse stable and spread it in the gutters of the cattle stables daily. The cattle stables are then cleaned out by means of a carrier or cart, and the manure is taken direct to the field. When this is done, all the manure is saved and applied to the land upon which it is needed without loss from fermentation or other cause.

LAND PLASTER ON THE STABLE FLOOR.

The best kept cattle stables are frequently sprinkled with land plaster. One of its most valuable effects is the fixing of the ammonia if the manure in the pile should tend to heat. In any case, there is a constant tendency for ammonia to escape, and plaster largely arrests this waste. It requires very little if it is used in the stables immediately after they are cleaned in the morning. Eight or ten pounds dusted over the wet places each day in a stable containing 30 cattle will suffice. Slaked lime would only accentuate the difficulty. That is, it should be used where one wants to hasten decomposition, as when corn-stalks, coarse straw and the like are piled up for the purpose of rotting down into available manure. If plaster is not available, scrape up some swamp muck in the summer, or some black soil from the lowlands, or even dry soil of any kind, all of which should be stored in dry weather in the summer, so that they will be available in the winter as absorbents for the stable. If stored when they are fairly dry and kept for three or four months under cover, they will be quite dry when wanted for use. However, none of these materials is as effective as land plaster in arresting the escape of ammonia, nor do any of them conduce to tidiness and sweetness of the stable as does the p[laster].

SAWDUST AS A MANURE.

The direct application of sawdust to light soil is not good. If the soil be heavy clay in need of lightening and mellowing, an application of sawdust would do no harm. On a sandy soil, crude sawdust might do more harm than good. If, however, it could be first rotted—as with barnyard manure—it would un-

doubtedly prove most valuable for the land. As dry sawdust is a clean, easily handled litter, having a high absorbent value, it might well be used in the cow barn, pig pen and other places where there may be liquid manure to absorb. Thus much valuable plant food may be saved, and the subsequent fermentation of this sawdust manure in the heap will tend to liberate the elements of fertility in the sawdust and partly convert them into humus compounds. The sawdust of hardwood contains more plant food and rots more readily than that of pine. Manure made with sawdust is very apt to fire-fang and spoil if left in too large a heap. It should be kept moist and occasionally turned over. Apply in the spring, lightly ploughing under or harrowing in, just before seeding. Such manure also makes an excellent spring dressing for grass lands.

COMPOSTS.

The materials used in making composts are many, indeed any organic substance—vegetable or animal—which forms a waste product on the farm may be employed to advantage. Straw, leaves, muck or peat, turf, weeds and kitchen waste are among the more common constituents of compost heaps. In order to induce their decay—and thus liberate plant food in available form—they may be mixed with manure, urine, fish, flesh, etc., which set up an active fermentation and lead to a quick disintegration of the whole mass. In the place of such animal refuse as just enumerated, certain alkaline materials—lime, wood ashes, etc.—are sometimes used, these substances favoring the growth of the bacteria or germs which break down the vegetable organic matter.

The exact size and plan of the compost heap is not a matter of much moment, but it is usual to have alternate layers of the vegetable refuse and of the manure, of about six inches thick, the height being from three to four feet, and the superficial area governed by the amount of material to be composted. The quality or richness of the manure should regulate to some degree the amount necessary, but it is always well to have somewhat more than is absolutely required to set up fermentation throughout the mass, as otherwise weed seeds may escape destruction.

DISSOLVING BONES WITH LIME.

A method for the reduction and disintegretion of bones with lime is as follows: Spread the bones in a layer from four to six inches deep and cover with a layer of freshly burnt quick-lime to an equal depth. Then should follow a layer of about the same thickness of muck, peat, or good loam. This order is then repeated until the heap is, say, three feet high, the final layer of muck being somewhat thicker, say, 10 inches or one foot. By means of a stout, pointed stick or iron rod, make a number of holes through the mass and pour in water sufficient to slake the lime. The heap should be of sufficient dimensions to retain the heat caused by the slaking of the lime and the fermentation of the muck for six or eight weeks, when, if all has worked satisfactorily, the bones will be quite brittle and the heap can then be shovelled over to mix the various constituents.

Bones may also be dissolved with ashes. A strong box or cask should be secured, and in it should be packed fresh hardwood ashes and finely smashed bones. Water should be poured upon the mass, which will make lye to dissolve the bones. The box or cask should stand under cover so that the quantity of water applied will be under control. The time it will take to reduce the bone will depend upon the amount of potash in the ashes and the fineness of the broke

bones. Water should be added as it evaporates from the surface. The process can be hastened by putting into the mass a few pounds of common potash. This is only necessary to save time. When the mass is soft enough to break down with a spade, it can be mixed with land plaster or dried loam to make it convenient for handling. It is a concentrated manure and should be applied with discretion.

WOOD ASHES AS FERTILIZER.

An average sample of unleached wood ashes contains about six per cent. of potash and two per cent. of phosphoric acid. Besides the actual fertilizing value, by reason of the potash and phosphoric acid contained in the ashes, there is some value to ashes simply from the power which potash has to make the nitrogen of the soil available for plants by its chemical action on the organic matter and humus in the soil. The potash in ashes exists in a readily soluble form and is thus immediately available for plant food. Ashes also contain a little magnesia and a considerable amount of carbonate of lime which is of some importance because of its effect in improving the texture of heavy soils.

Leached ashes have rarely more than one per cent. of potash and one-half per cent. of phosphoric acid. Coal ashes have little value as fertilizer, but on heavy soils they may often be applied with profit just for the loosening effect, and they are valuable as a top dressing, or mulch in fruit gardens. Sifted coal ashes absorb liquids, fix volatile ammonia, prevent offensive odors and are valuable as absorbents under hen roosts or in stables. Wood ashes should not be placed under hen roosts or in stables, because potash liberates ammonia and the quality of both the manure and the ashes as fertilizers is deteriorated.

On average soils, fruits and vegetables are benefited by liberal applications of wood ashes, and remarkable results have been obtained by the use of ashes on legume crops, especially clover and alfalfa. Ashes will not make so valuable a fertilizer for top dressing for wheat as when used with the crops mentioned. Corn will doubtless be more benefited than wheat by the use of ashes as a fertilizer. However, if the soil is lacking in the potash element, a dressing of wood ashes will benefit almost any crop.

Ashes are best applied in the spring, separately or in connection with phosphate fertilizers as a top dressing. For cultivated crops the ashes should be spread broadcast after the land has been harrowed and made practically ready for the crop and cultivated in by a light harrowing.

PEAT AND MUCK AS FERTILIZERS.

The value of peat and muck, from the fertilizing standpoint, lies in the humus-forming material and nitrogen they furnish to the soil. Samples differ largely in these respects; those containing least foreign matter (clay, sand, etc.) as a rule proving the best, though the readiness with which further decomposition in the soil can take place is also a measure of value. Speaking generally, the application of these materials in the crude and raw condition is not to be advised, for their plant food does not exist in immediately available forms. Fermentation is necessary to set it free. Further, the mode of occurrence develops acid, and as acidity or sourness is more or less injurious to ordinary farm crops, it is desirable to correct this quality before the muck is applied to the soil.

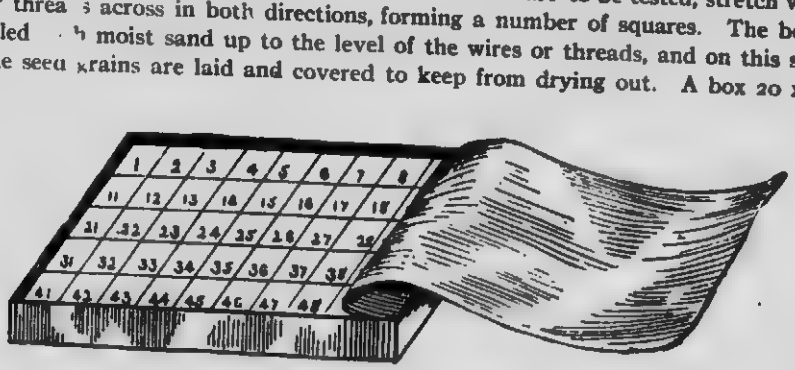
In the first place, after digging the muck—which may be done at any time when other work on the farm permits and the bog is sufficiently dry to be accessible to teams—it is well to pile it, and allow it to so remain throughout the winter.

The weathering—the action of the air and frost—serves to sweeten and di integrate the muck, oxidizes any poisonous iron compounds that may be prese and thus prepares it for more ready decomposition in the compost heap. Th muck may now be composted, as with wood ashes, or lime, or, perhaps bett still, with farmyard manure—and there should result a manure particularl beneficial to all classes of soils in need of organic (vegetable) matter.

Air-dried and roughly powdered muck—and especially that from the upp layers of the bog composed chiefly of sphagnum and other mosses—is an excellen absorbent. Its use as such in and about the farm buildings, or wherever ther is liquid manure likely to go to waste, is one strongly to be advised.

SEED CORN TESTER.

A shallow box filled with sand makes a very serviceable tester for see grain. In the case of corn, when individual ears are to be tested, stretch wire or threa s across in both directions, forming a number of squares. The box i filled · h moist sand up to the level of the wires or threads, and on this sand the seed grains are laid and covered to keep from drying out. A box 20 x 4



inches would have 200 squares each 2 inches x 2 inches. A plain moistened cloth is placed over the kernels, and a sack made for the purpose and partially filled with sawdust, about two inches thick, is then placed on top of the cloth. The tester is placed where it will be held at ordinary room temperature or warmer for five or six days. Five or six grains are placed in each square and record numbers attached to the ears to correspond with numbers on squares.

LIME AND LAND PLASTER.

As a means of supplying lime to act as a plant food on soils deficient in this constituent, land plaster (sulphate of lime) may serve equally as well as lime. But lime has several useful functions in addition to the one referred to, functions which land plaster is incapable of performing.

In the first place, lime, being an alkali, will correct the acidity or sourness of soils. This is a most valuable property, as sourness is more or less injurious to the majority of our farm crops. Muck soils especially are apt to be sour, but we also frequently find sandy soils slightly acid, even though they be fairly well drained. Secondly, lime promotes nitrification, that is, it favors the formation of nitrates—the compounds from which crops (with the exception of the legumes) can alone obtain their supply of nitrogen. It is for this reason chiefly that soils rich in vegetable matter receive so much benefit from an application of lime. It is very doubtful if land plaster has any value in this respect, but marl (carbonate of lime) could for this purpose be used to advantage if lime

is not obtainable. In the third place, lime plays an important part in the improvement of the physical condition of soils—both clays and sands. Its action on the former is to destroy plasticity, increasing mellowness, and with the latter it acts largely as a cementing material, making the sand more compact.

Land plaster is generally used as a top dressing for grass lands, having the tendency to increase the growth of the clover. It may also be employed for peas and other legumes. The application may be 500 lbs. per acre, broadcasted in the spring. Lime may be employed on ordinary soils at the rate of 20 bushels per acre, with twice that quantity for heavy clays. After slaking in earth-covered heaps on the ploughed field, it is spread and harrowed in.

HOW TO APPLY LIME.

One way of applying lime is to distribute the freshly-burned lump lime in small piles over the field after the land has been prepared for the crop. Throw a little water on the lime, cover it with fine earth, and, after it has thoroughly slaked, mix it with more earth and distribute with the shovel. Half a peck of lime to the square rod would give twenty bushels, or 1,400 pounds, to the acre. As lime absorbs nearly one-fourth its weight of water (24 per cent.) in slaking, this would give about 1,750 pounds of slaked or hydrated lime per acre.

Slaked lime is a disagreeable material to handle, but it is sometimes applied in this condition, being spread from waggons; but any method of hand-spreading involves irregularity in distribution, and therefore a waste of material. Slaked lime may be successfully spread with the ordinary manure spreader by first placing a quantity of litter on the spreader apron to prevent the lime from sifting through and to bring it within reach of the teeth of the spreader, and setting the apron to travel slowly.

THINGS TO KNOW ABOUT FERTILIZERS.

A complete fertilizer is one which contains the three essential fertilizing constituents, i.e., nitrogen, phosphoric acid and potash.

Nitrogen exists in fertilizers in three distinct forms, viz., as organic-matter, as ammonia and as nitrates. It is the most expensive fertilizing ingredient. Nitrates furnish the most readily available forms of nitrogen. The most common are nitrate of soda and nitrate of potash (salpeter). Nitrification is the process by which the highly available nitrates are formed from the less active nitrogen of organic matter, ammonia, salts, etc. It is due to the action of minute microscopic organisms.

Phosphoric acid, one of the essential fertilizing ingredients, does not exist alone, but in combination, most commonly with lime, as phosphate of lime in the form of bones, rock sulphate and phosphatic slag. Phosphoric acid occurs in fertilizers in three forms—soluble reverted and in soluble phosphoric acid. In natural or untreated phosphates the phosphoric acid is insoluble in water and not readily available to plants. Superphosphate is prepared from these by grinding and treating with sulphuric acid, which make the phosphoric acid more available to plants. Superphosphates are sometimes called acid phosphates.

Potash, as a constituent of fertilizers, exists in a number of forms, but chiefly as chloride or muriate and as sulphate. All forms are freely soluble in water. The chief sources of potash are the potash salts kainit, muriate of potash, sulphate of potash, and sulphate of potash and magnesia. Wood ashes and cotton-hull ashes are also sources of potash.

FERTILIZING VALUE OF SEAWEED.

The composition of seaweed is not the same for all species, and, more varies with the season of the year in which it is collected. It way safe said, however, that seaweed is well worth gathering and applying to the especially where there is a scarcity of barnyard manure. A sample of seaweed (Rockweed or Fucus) collected at Vancouver, B.C., and analyze the Central Experimental Farm, Ottawa, contained in the water-free mat 2.65 per cent. of nitrogen and 6.24 per cent. of potash. It is thus seen seaweed is rich in potash. In all cases where convenient to the farm the practice is to apply directly to the soil as all the organic matter and nitro is thus conserved. All seaweeds decay rapidly in the soil, liberating their pl food readily for crop use. They can also be advantageously used for the dressing of meadows, orchards, etc. Composts of seaweed made with man and good soil are useful for garden crops, but owing to the ready decomposit of the seaweed, especially in warm, moist, moderately light soils, compost is scarcely necessary for field crops.

Eel grass, which is not a true seaweed, contains less plant food and deca slowly in the soil. Composted eel grass, well worked into the soil, might expected to be of advantage for potato as well as for farm crops generally.

DOMESTIC SANITATION AND WATER SUPPLY.

"Many farm houses have Queen Anne fronts and Mary Ann backs," sai a writer recently. He meant that things looked nice from the main road— well trimmed lawn, neat flower beds, painted house and verandahs—while th

WELL CONTAMINATED FROM STABLE

backyard is littered with ashes, tin cans, broken boards, a five years' accumula- tion of rubbish and disease germs. Discard heaps will appear from time to time on most farms, but there is no excuse for allowing refuse to stand more

than a month at a time in summer, and there should be a thorough cleaning up every spring as soon as the snow disappears.

In summing up the chief sources of disease, owing to insanitary conditions, we may note the following:

(1) Stagnant water in sloughs or ponds near to the dwelling-house; (2) dampness of house caused by shade trees; (3) germ-laden milk caused by cattle drinking bad water; (4) littered and dirty door-yards; (5) wells polluted by drainage from stables or cesspool; (6) water from the kitchen sink; (7) insanitary barn-yards.

Farms have been abandoned because the family have all died through preventable diseases breaking out as a result of lack of care in relation to the disposal of dishwater, garbage, closet contents, or the use of impure drinking water supplied to the family or the stock, especially milking cows. Wells in barnyards or near stables are always a menace to health.

Water will dissolve and hold in solution many impurities with which it comes in contact. Not only some solid substances, but other liquids and gases as well as micro-organisms and minute particles of dust are taken up by water. On its passage through the soil, water dissolves various minerals such as lime and magnesia. These are not injurious, but surface water and water held in the upper layers of the ground frequently contains bacteria and pollution of the most dangerous types. These may percolate down through the earth pores and gravitate to the well and cause virulent disease before their presence is even suspected.

Well water should be analysed occasionally as a "safety first" measure, regardless of season or taste. Good tasting water may be full of enemy microbes. Well water should be derived from a spring or rock deep down in the ground in order not to be affected by seepage from the surface, which is almost certain to find its way into the well through gravel or sand formations, which are not always good filters. When practicable, the ground should drain away from the well naturally, even the substrata inclining at a sharp declivity. Live stock should be kept a safe distance away from all wells.

It should be impossible for cats, rats, reptiles or other animals, or foreign substances, to get into a well. To prevent this, concrete or sound plank boxing and platforms should be provided. Artesian wells are most desirable where the geological formation makes such possible. Protected ventilation will keep well water more healthful than water hermetically closed in.

BUILDING UP WORN-OUT SOIL.

Probably the best course to follow in building up a depleted farm is to get some vegetable matter in the soil. This may be done by applying stable manure at the rate of ten or more loads per acre, or ploughing down a green crop. Either or both of these plans would render the soil moist, friable and suitable to seed down with clover. For a quick-growing green crop, buckwheat, at the rate of five pecks per acre, is probably the best to sow, or peas and oats sown together at the rate of nine pecks per acre would also produce a good bulk of crop to turn under. Plough the land and work it with the cultivator two or three times, then after a shower sow the seed for the green crop. Plough the crop down before the seeds form, then work it up late in the fall, and in spring sow barley thinly and seed down with a mixture of five pounds of red clover, six pounds alfalfa, three pounds of timothy and four pounds of orchard grass seed per acre. In case an application of stable manure can be given either before the green crop seed is sown or in the fall, so much the better for the field.

RECLAIMING ALKALI LANDS.

Many of the alkali lands in the West may be reclaimed, if the farmer has patience enough to persevere. The more important points to be kept in mind are as follows:

Leaching and Underdrainage.—This is only possible where there is provision for irrigation. Simply flooding the land will not be effective, as the alkali will rise again to the surface. If, however, underdrains are put in, the injurious salts washed out of the surface soils will be carried away.

Deep Ploughing and Constant Cultivation.—These are the means to be adopted for patches of alkali, and more especially where irrigation cannot be practised. Frequently the alkali is only present to an injurious degree in the upper few inches of the soil and deep ploughing buries it. Frequent cultivation of the surface subsequently keeps the alkali from rising by checking evaporation. The dry earth mulch so formed destroys capillarity, the means by which the moisture reaches the surface, bringing the soluble alkali salts with it.

Heavy dressings of the patches with horse manure is often sufficient to reclaim the soil in a few seasons. It furnishes food to the crop while still tender and forces it along until it is robust enough to withstand the action of the alkali. The treatment of "black" alkali calls first for an application of land plaster or ground gypsum. This converts the corrosive carbonate of soda into milder forms. One or more of the methods already described may then be adopted. The quantity of land plaster may vary from a few hundredweight to several tons per acre, according to the amount of carbonate present.

RECLAMATION OF MUCK LAND.

In reclaiming swampy or muck land, first drain the land as thoroughly as possible by means of open trenches or ditches. After a year or two, it may be more possible to drain more completely and satisfactorily by tiles; it is best to defer this work until the land has had an opportunity to settle and become compacted. In burning the brush, which may be piled into moderate sized heaps, a time should be chosen when the surface of the swamp only is dry; otherwise the fire may spread and destroy the greater part of the soil.

At first, the ploughing should be shallow, and, for the first season disc harrowing may possibly suffice. A dressing of barnyard manure will be found most beneficial at the outset, not only to furnish available plant food, but to inoculate the soil with the bacteria necessary for the decay of the muck, and to improve its tilth. Lime, or, still better, wood ashes, is excellent for muck soils, correcting their acidity, and supplying the mineral elements necessary for crop growth and naturally lacking in such soils. In the place of wood ashes, five hundred pounds of basic slag and one hundred pounds muriate of potash, per acre, may be used. Apply by broadcasting in the spring and harrow in. The best crop to sow at first will be a mixture of timothy and clover.

TO PREVENT CLODS FORMING.

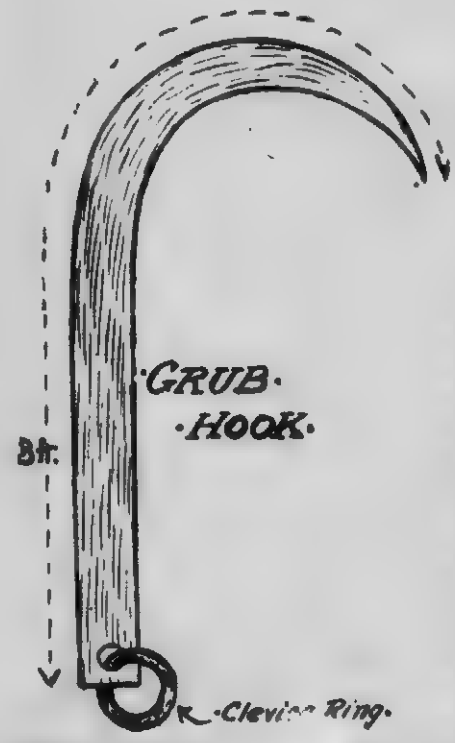
One of the worst difficulties with which the farmer has to contend is clod formation. Where land contains a good deal of clay and is compacted by the tramping of live stock after the frost is out, it may be expected to break up cloddy. The same is true where land containing any considerable amount of clay is ploughed when too wet. How is the farmer to obviate this difficulty? The easiest and most effective way is to harrow before he unhitches for dinner

or for supper, particularly so if the weather is warm and dry, and more particularly if there is a dry wind from the west or southwest. Much depends upon the character of the soil, and particularly upon its clay contents. Clods will form in four hours which it is impossible to break up or mellow down until they receive a soaking rain, and not even then without being dealt with in the right way and at the right time.

When farmers are ploughing in the fall, they should not harrow, but leave the ground rough; but the man who makes it a rule to have the harrow in the field in the spring and thoroughly harrow each half day's ploughing before he leaves the field will find it exceedingly profitable business. At that time there may be material for a clod, but it has not yet formed. If this is not harrowed and the day is warm and the atmosphere dry and there is considerable wind, the water is evaporated out of this clod material and clod formation is inevitable.

The object in preparing a seed bed is to create conditions under which the roots of the tender plants can have full and free development. The more clods in the field, the more air, the quicker it dries out, and the more wide spaces over which the rootlets can not pass.

CLEARING SCRUB LAND.



Much of the new land in the west has a growth of small trees such as poplars and willows. After clearing away the larger trees, the ground is broken with teams or with tractors using plows specially adapted for the work of cutting roots. A homesteader in the Peace River district gives a description of a hook that is very serviceable in preparing for the operations of the plow. It was made from the landside of an old brush breaker log drawn by a blacksmith to the shape indicated in the sketch. The total length around the curve from hook ring to point is about there feet. A pair of oxen or a steady team of horses will handle it to advantage. Poplarstumps often have two main roots, one on each side of the stem. Hooking under one of these, it is often possible to tip the stump over and get it out of the way. Willows occur commonly in slumps, and, after the tops have been chopped away, the hook can be placed under the crown to tear it a[illegible]. When the plowing has already been done, this hook may be employed [illegible]e necessary after grubbing, but it does its best work ahead of the breaker.

JUDGING QUALITY OF SOIL.

Rich soils, whether clay or sandy loams, are invariably well supplied with vegetable organic matter (humus), and the unt present is usually indicated by the color. Black or a deep brown color is, therefore, an excellent indication of fertility. The depth of this black surface soil is also a matter of importance —the deeper the better, of course. The mechanical condition is somewhat harder to gauge in the soil. It should be mellow and friable, easily reducing by pressure in the hand, unless very dry. There should be a constant outlook for the presence of stagnant water, showing lack of natural drainage. Lastly, the character and vigor of the herbage should be paid attention to. If the land is well covered with a luxuriant growth of good grasses, there need be little hesitation in deciding that the soil under cultivation will give good crops.

CLEARING PINE STUMPS.

The cheapest and most satisfactory way to get rid of pine stumps is to burn them out. The common method of burning them is to dig a hole about twelve inches deep with spade or post-hole digger on one side of the stump, as close to it as possible, and to use this as a furnace for firing the stump. In digging these holes it is necessary that the dirt be removed from as much of the surface of the stump as possible, so as to allow the fire to come in direct contact with the side of the stump for at least six inches. Burning stumps by this method is rather a slow operation, but in the hands of careful workers is practically as cheap as pulling them, besides it can be engaged in by a single individual without the expenditure of more than two dollars for purchasing the necessary implements. In burning the stumps by this method, the object should be to keep the fire going in ach furnace by using as little wood as possible, and this to consist as largely as possible of knots that can furnish a high heat, are entirely consumed, and consequently do not fill up the hole beside the stump as the bark and trash would do. After the stumps are thoroughly heated and ignited, it is very helpful to use ordinary poles of any kind to assist in burning them, standing the poles diagonally into the hole and well against the stump at the lower end and keeping them pushed down as this end burns away.

The burning of stumps by the above method may be greatly hastened and facilitated by boring an augur hole diagonally through the stump from a little below the surface of the ground on one side into the post hole or furnace on the opposite side. This serves as a flue through which the heat and flames pass out of the furnace, heating the stump to its ignition temperature in less than one-fourth the time required without it. After a stump thus treated becomes thoroughly heated, it usually burns out with very little more effort on the part of the attendant, and in most instances to a sufficient depth beneath the surface to be out of the way of ploughs or cultivators.

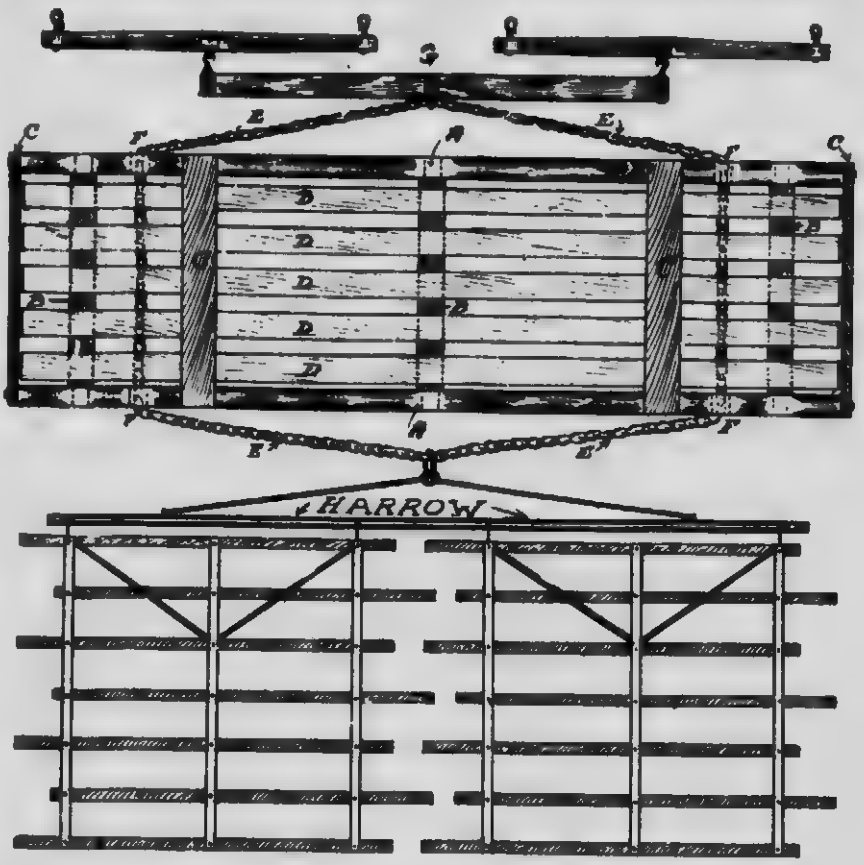
GREEN MANURING WITH BUCKWHEAT.

In ploughing under a crop of buckwheat while still green and succulent, the soil receives vegetable matter that will readily undergo decay, forming humus that will more or less quickly become so incorporated with the sand and clay as to form part and parcel of the soil. During the process of this partial decay of the organic matter (humus formation) in the soil, the elements of its plant food, nitrogen, phosphoric acid and potash are liberated in forms at once available for plant nutrition. In the case of buckwheat, these elements have

all been drawn from the soil upon which the crop grew—the turning under of the buckwheat adding to the amount of available, not to the store of total, plant food. With clover and other legumes there is a large addition of nitrogen to the soil, these plants having the property of appropriating much atmospheric nitrogen through the agency of certain soil bacteria.

PACKER AND PULVERIZER.

Combination of implements enables the prairi. farmer to handle a greater area than the older methods of single operations. On summer fallows, when the object is to hold moisture by leaving a loose surface, a contrivance known as a



packer-pulverizer to is found to work well. It consists of a log drag with a two-section lever harrow chained on behind. Planks are laid upon the drag for the driver to stand on and to this may be added a box to carry stone and roots picked up while crossing the field, thus weighting the drag and at the same time ridding the land of a nuisance. The drag was made out of two spruce logs about seven inches thick and ten feet long, placing the one two and a half feet behind the other and parallel with it and joining them with three cross-pieces mortised into two-inch augur holes. The plank are laid on these. To give greater rigidity a couple of boards are nailed across on top and another across each end, spiking these latter into the ends of the logs.

To attach the harrow without imposing too much strain on the rear log and thus tending to pull the logs apart, make two pairs of chain holes through the logs and pass a logging chain—it would take two short ones—through a the chain holes, hooking the ends together so as to form a circuit. The evene clevice is attached to the centre in front and the harrow clevice to the centr behind. The chain is allowed enough slack to give the stock sufficient room t turr and prevent too great tendency to lift on the forward log. The draft o the harrow comes on the chain, and not on the drag. Four horses are required

The logs mash down the lumps and compress the furrow slice not a little while the harrow following produces a dust mulch, leaves the surface rough and helps to sift loose dirt into the interstices beneath. In the diagram A. A are spread logs seven inches by ten feet; B. B. B., cross pieces two feet six inches mortised into log; D. D., planks fastened to cross piece; C. C., cross pieces, two over plank and one at each end fastened to logs.

PRESERVATION OF POSTS.

Of the many processes that have been suggested for the prevention of dry rot in wood, a number require special apparatus for their application and consequently can only be worked economically on a large scale. Such, for instance, is the method of impregnation with oil and tar or creosote, in which the dry wood is placed in an iron cylinder, the air exhausted and the heated oil allowed to flow in. When the cylinder is full. a pressure of 150 to 200 lbs. per square inch is employed until the wood is fully saturated.

Owing to the somewhat expensive machinery necessary, this highly successful method seems inapplicable on the farm. A modification of this method, however, which is quite practicable, and which is effective in preventing the posts from rot for a number of years, is to have the wood as dry as possible, thoroughly char the part that will be in the soil, and soak, while still hot, for some time in creosote, or—if the latter is not available, or considered too expensive—in boiling coal tar. The application of the hot creosote to the dry wood by means of a large paint brush is a still simpler plan.

The impregnation of timber with various chemicals has long been practised as a means of preservation. The more widely used salts for this purpose are corrosive sublimate, chloride of zinc, bluestone and copperas, the two first named being apparently the most effective. The strength of the corrosive sublimate is one pound of the chemical in ten gallons of water, and of chloride of zinc, one pound dissolved in four gallons of water. The posts—or rather that part to be put in the ground—should be allowed to soak in one or other of these solutions for several days. While such treatment may not completely prevent all decay, experience has shown that the benefit derived far exceeds the costs of the process.

TO PREVENT POSTS HEAVING.

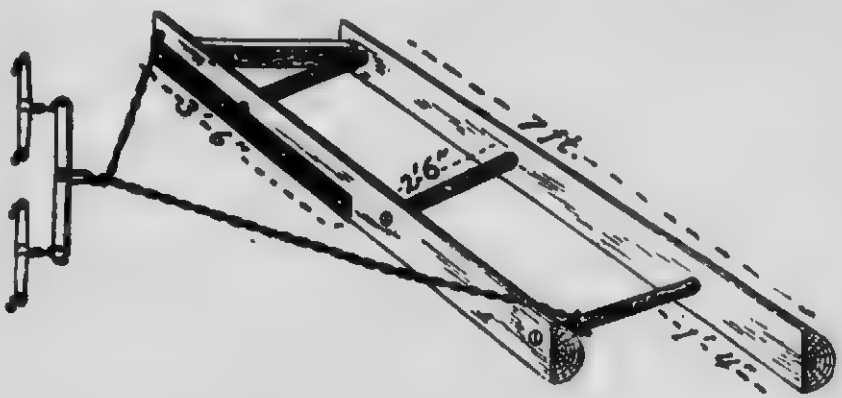
Posts set in low ground will not heave if they are set down about three feet and pieces of scantling about fifteen or eighteen inches long are firmly spiked on near the bottom end at right angles to the posts. It is well to let the scantling two or three inches into the side of the front by sawing out a notch.

WATERPROOFING CANVAS.

The following is highly recommended as a simple and cheap process for coating canvas for stock covers, waggon tops, etc. It renders the canvas impermeable to moisture, without making it stiff and likely to break. Soft soap is dissolved in hot water and a solution of iron sulphate (otherwise known as copperas or green vitriol) is added. A chemical action takes place between the potash of the soap and the sulphuric acid of the iron sulphate, forming an insoluble iron soap. This is washed and dried and mixed with raw linseed oil, when it is ready to apply as a paint to the canvass.

THE KING ROAD DRAG.

On highways maintained by a comparatively small population, macadamising or even gravelling is, in many cases, so expensive as to be out of the question. It is, therefore, imperative to adopt some cheap, effective means of keeping the dirt roads in good condition. A plan which is being followed with very satisfactory results is one originated by D. Ward King, of Missouri, who, about ten years ago, made a drag consisting of two halves of a split log, seven to nine feet long, placed parallel on edge, one about thirty inches behind the other,



DRAG FOR MUD ROADS

with flat sides to the front. They are connected with three strong oak or hedge bars, the ends of which are wedged in two-inch augur holes bored through the timbers. Near the ends of the front log are attached the ends of a chain, to which the double-tree is attached, nearer the right side than the left, so that when in motion the drag is angling, and thus draws the dirt to the centre of the road. After wearing a few months, the lower edges of the drag may be shod with iron. The entire cost of making is estimated at $1.25.

This implement is used when the roads are yet muddy after a rain. The strong point claimed for it is that, by puddling the clay at this time, it quickly becomes hard, making a first-class road.

THE METRIC SYSTEM.

The metric system of weights and measures is based upon the (assumed) length of the direct distance from the equator to the north pole. The ten-millionth part of this distance, as calculated in 1795, was adopted by the French Government as the unit of length, and called a metre. All other measurements

are derived from this unit. The unit of capacity is the litre, which is the cu of a tenth part of the metre. The unit of weight is the gram, which is the weig of that quantity of distilled water at its maximum density which fills the cu of a hundredth part of the metre. The are, the unit of surface, is the squa of ten metres.

Each unit has its decimal multiple and sub-multiple, that is, weights a measures ten times larger or ten times smaller than the principle unit. T prefixes denoting the multiples are deca, ten; hecto, hundred; kilo, thousan and myria, ten thousand. Those denoting sub-multiples are deci, ten; cen hundred; milli, thousand. Thus, a decagram is ten grams; a hectogram is hundred grams or ten decagrams; and a kilogram is a thousand grams or t hectograms. Similarly, a decigram is a tenth part of a gram; a centigram is hundredth of a gram or a tenth of a decigram; and a milligram is a thousand of a gram or a tenth of a centigram.

The equivalents in our measurements of some of the metric measures mo frequently met with are as follows:

A meter	39 37 inches—3¼ feet
A kilometer	3,280 feet, 10 inches, or 3-5 of a mile
A litre	1 quart
A kilogram	2.2 lb. avoirdupois
A gram	15½ grains
A hectare	2 1-3 acres
A square meter	10 square feet

WEIGHTS OF EVERYDAY THINGS.

A barrel of flour weighs	196 lbs.
A barrel of salt "	280 "
A barrel of beef "	200 "
A barrel of pork "	200 "
A barrel of fish "	200 "
Cement (Hydraulic) weighs per bushel	62–96 "
Gypsum ground, weight per bushel	70 "
Lime, loose, weight per bushel	70 "
Lime, well shaken, weight per bushel	80 "
Sand at 98 lbs. per cubic foot, per bushel	122½ "

LEGAL WEIGHTS OF PRODUCE.

By Act of Parliament, the legal weights per bushel of the various grain and products are as follows:—

Barley	48 lbs.	Indian corn	56 lbs
Beans	60 "	Oats	34 "
Beets	50 "	Onions	50 "
Blue grass seed	14 "	Parsnips	45 "
Buckwheat	48 "	Peas	60 "
Carrots	50 "	Potatoes	60 "
Castor beans	40 "	Rye	56 "
Clover seed	60 "	Timothy seed	48 "
Flax seed	56 "	Turnips	50 "
Hemp seed	44 "	Wheat	60 "

The legal weights per bag are:—

Beets	75 lbs.
Carrots	75 lbs.
Onions	75 lbs.
Parsnips	65 lbs.
Potatoes	90 lbs.
Turnips	75 lbs.

SURVEYORS' MEASURE.

7.92 inches	1 link
25 links	1 rod
4 rods	1 chain
10 square chains or 160 square rods	1 acre
640 acres	1 square mile
36 square miles (6 miles square)	1 township

HOUSEHOLD MEASURE.

Forty-five drops of water is a teaspoonful.
One teaspoonful equal one fluid drachm.
One dessertspoonful equals two teaspoonfuls, or two drachms.
One tablespoonful equals two dessertspoonfuls, or four teaspoonfuls.
Two tablespoonfuls equals eight teaspoonfuls, or one fluid ounce.
One common sizewine glassful equals two ounces or one-half gill.
One common size tumbler holds one-half pint.
A small tea-cup is estimated to hold four fluid ounces or one gill
One pound of wheat is equal to about one pint.
One pound and two ounces of Indian meal is equal to one quart.
One pound of sugar is equal to about one pint.
A pint of pure water is about a pound.

CONVENIENT LAND MEASURES.

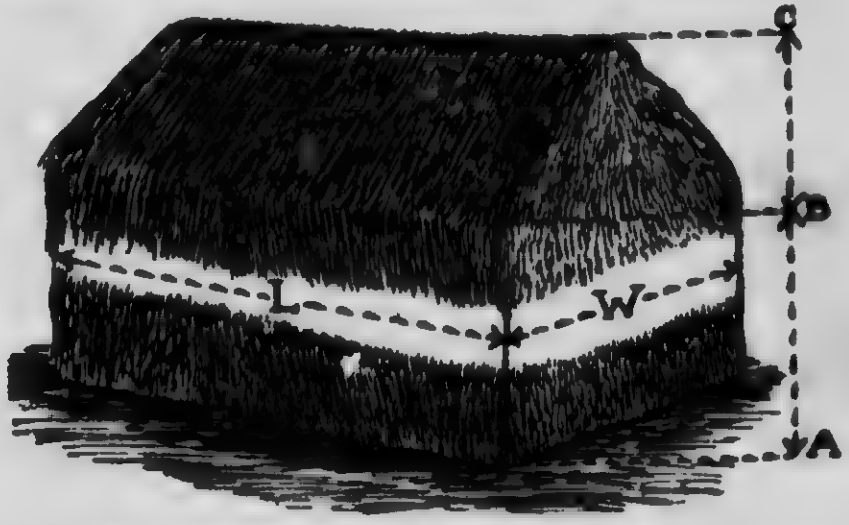
10 rods by 16 rods	1 acre	40 yds. by 121 yds.	1 acre
8 rods by 20 rods	1 acre	220 feet by 198 feet	1 acre
5 rods by 32 rods	1 acre	110 feet by 396 feet	1 acre
4 rods by 40 rods	1 acre	60 feet by 726 feet	1 acre
5 yds. by 968 yds.	1 acre	120 feet by 363 feet	1 acre
10 yds. by 484 yds.	1 acre	300 feet by 145.2 feet	1 acre
20 yds. by 242 yds	1 acre	400 feet by 108.9 feet	1 acre

MEASUREMENT OF GRAIN IN BIN.

Since wheat varies in weight per measured bushel it is impossible to tell exactly the number of bushels in a given volume. The standard bushel in Canada is the Imperial, which contains 2,218.192 cubic inches. In the United States the Winchester bushel, which contains 2,150.420 cubic inches, is used. The Imperial bushel contains approximately .78 cubic feet. To multiply the number of cubic feet in a bin by therefore would give the number of bushels. This is simply done by multiplying the cubic feet by 78 and dividing by 100. A simple rule which is frequently used in measuring grain in elevators is to multiply the cubic contents in feet by eight and stroke off the last figure. This is only approximate, but of course approximate results only can be obtained from measurements.

MEASURING HAY IN THE STACK.

There is no accurate way of estimating the quantity of hay in a stack, because the weight of a cubic foot of hay will vary with several conditions that usually cannot be determined accurately. Hay cut when somewhat overripe will not settle so much as hay cut at an earlier stage; some kinds of hay are naturally heavier and will settle more closely than others; the higher the stack or mow, the more closely it will settle. On this account, the number of cubic feet required to make a ton in a settled stack will vary from 343 cubic feet, or a seven-foot cube, to 512 cubic feet, or an eight-foot cube. In an average stack of wild hay, ten or twelve feet high, well settled, about 425 cubic feet will make a ton. The most accurate way for finding the number of tons of hay in a stack would be



to cut a definite number of feet from the end of the stack, load it on a waggon and weigh it. This would give a reasonably accurate basis for determining the balance of the stack by measuring. There are several methods for determining the number of cubic feet in a stack. The simplest way is to find the number of square feet represented by a cross section through the stack, then multiply this by the length of the stack. One can usually estimate this cross section very closely by multiplying the average height by the average width. In the diagram herewith shown, the sides of the stack are built up perpendicularly, then drawn into a peak. The height A-B, plus one-half of the height B-C, would represent the average height multiplied by the average width W, multiplied by the average length L, would give the number of cubic feet in the stack.

SIZE OF APPLE BARRELS.

All apples packed in Canada for sale in Canada by the barrel, in closed barrels, must be packed in good and strong barrels of seasoned wood of the following dimensions, as nearly as practicable: length of stave, twenty-eight and one-half inches; diameter of head, seventeen and one-eighth inches; distance between heads, twenty-six inches; circumference at bulge, sixty-four inches outside measurement, representing as nearly as possible seven thousand and fifty-six cubic inches.

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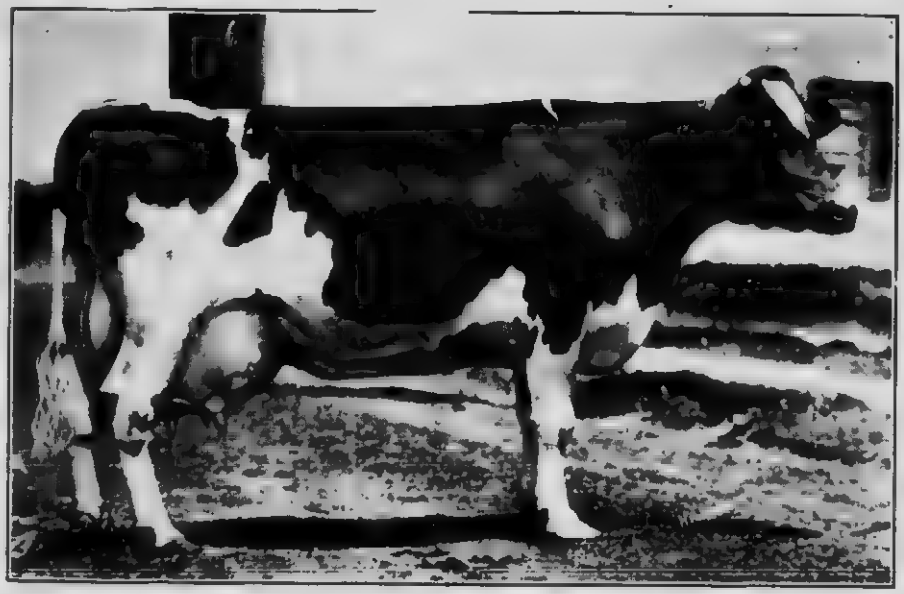
The Shorthorn (Durham) is the most widely distributed of the beef breeds. Bulls of this type, mated to grade cows, have revolutionised the character of the meat stock of the world. The milking shorthorn is also coming into prominence.

The Hereford has taken a strong hold in the Western States and on the Alberta ranches. In point of hardiness it ranks with the Angus and Galloway. Bulls weigh as much as 2,200 lbs; cows 1,500 pounds.

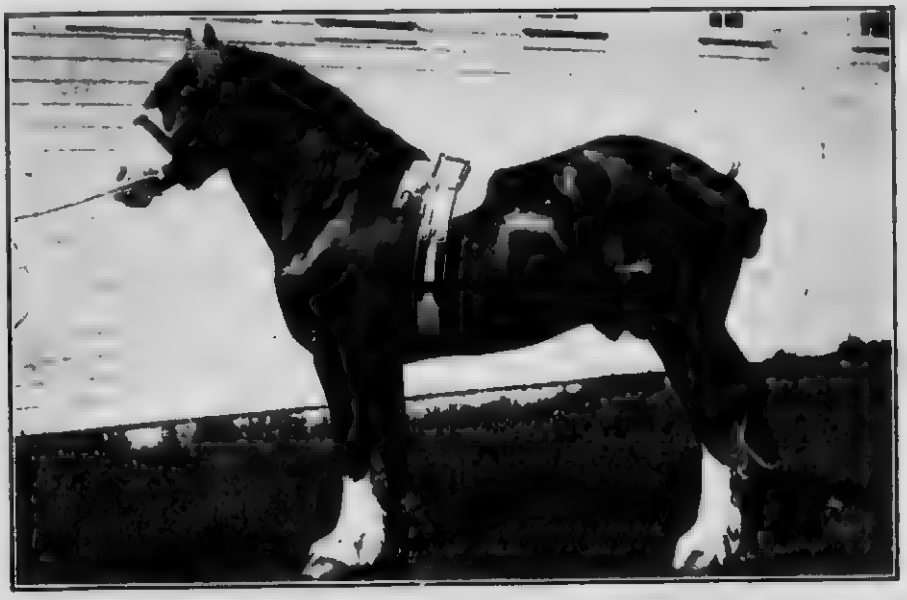
Aberdeen Angus steers have captured more prizes than any of the other breeds at fat stock shows in recent years. The polled head and cylindrical body are the striking characteristics.



WOODCREST DORA DE KOL. This cow has a record of 35.89 lbs. butter fat from 648.4 lbs. milk in seven days. She is a Holstein. This breed excels in size of body and in milk production.

BROADVIEW ROSE, the B.C. Ayrshire cow that gave 21,423 lbs. milk in a year. Ayrshires are widely distributed in Eastern Canada, being well adapted to cheese making.

JERSEY COW.—This breed is justly famous as butter producers. Maturity is earlier than with other breeds, heifers frequently freshening before two years old.



A Clydesdale, bred in Alberta, showing the characteristic limbs and strong back of the breed. Admirers of the Clydesdale claim superiority in action and soundness in feet.

BELGIAN DRAFT HORSE.—This breed was nearly wiped out by the war. The legs are devoid of long hair and are remarkably short. The perpetuation of this blocky type is assured through excellent importations having been made into the United States before the war.

AN ONTARIO PERCHERON.—A winner at the Winter Fair. This has become an exceedingly popular breed in the United States, and many importations have been made into Canada. Mature stallions weigh from 1,700 to 2,000 pounds.

The Hampshire Sheep is distinguished by its very dark brown head and Roman nose. Its wool does not grade high, but for early lambs the breed is unexcelled.

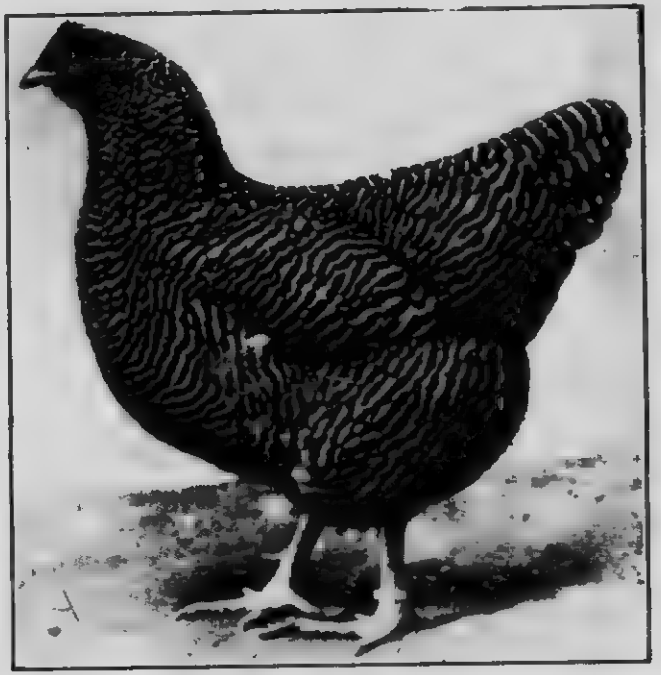
COTSWOLD RAM.—The Cotswold is one of the oldest of the English breeds of sheep. It is quiet in temperament, but, being a heavy feeder, it does best where plenty of grass, roots and grain can be produced.

SHROPSHIRE RAM.—The Shropshire, as a mutton producer, ranks next to the Southdown. It is suited for crossing with native ewes. The wool is of fine quality but shorter than that of the Oxford.

DORSET RAM (horned). Lambs of this breed grow rapidly, and under most favorable conditions ewes produce twice a year. Fleece is short and staple is of medium grade.

LEICESTER EWE.—The Leicester gives a fleece weighing from 6 to 10 pounds of fine grade long wool. This breed requires abundant pasture and is not suited to rough ground.

Barred Plymouth Rock Rooster.



Barred Plymouth Rock Hen. A "dual purpose" type. The favorite bird with the farmer.

Single Comb White Leghorn Rooster.

Single Comb White Leghorn Hen, unexcelled for production of eggs and small broilers.

THICK SEEDING OF OATS.

The chief reason for sowing oats thickly in the West on rich soil i to hasten maturity. If oats are sown thinly they will tiller more or less and this retards maturity. On rich soils, grain sown thinly would be very late in maturing and this, where frosts come early, would, of course, be disastrous to the oat crop. The vitality of oats is more easily affected than either wheat or barley by frost. On the sharp soils of the West, such as occurs about Indian Head, possibly two bushels to two and a half is plenty thick enough to seed with oats. In Scotland, where the season of growth is rather short, they sow even as high as five bushels per acre.

Thick seeding of oats will not lodge so badly as thinner seeding, as the straw being finer, it is more pliable in the wind and rises more readily after a heavy storm. Less seed is required where only large plump well fanning mill selected seed is sown, as more of the seed will be vital than is the case where no selection is made.

MAKING HAY CAPS.

Hay caps may be made at small cost at home, and with proper care in drying out before they are stored away they will keep for years. Old flour sacks may often be obtained at a bargain. A good quality of duck or sheeting is the most durable material. Make the cap of the size to suit, at least 40 inches by 40 inches. If the intention is to use them for covering grain stooks, they may be larger.

Make hobs at the corners and button-hole stitch them for attachment of weights. To make water-proof prepare a solution of paraffin in gasoline. Apply the solution with a whitewash brush and keep well away from the fire. The gasoline will evaporate, and the paraffin will coat the cloth and make it water-proof Of course, such a bag cap is very inflammable and must be kept away from sparks or flame.

HAY FROM GREEN OATS.

To make good oat hay, the oats should be cut as soon as they have reached the milk stage—that is, when the heads have partly filled with a milky substance. The process of curing oat hay is similar to the curing of ordinary hay from grass or clover. It should be allowed to wilt on the top of the swath, then stirred up or turned, and when nearly dry it should be raked up and put into cock. It should cure in the cock until it is moderately dry, when it is ready to put into a stack or shed.

Single Comb White Leghorn Hen, unexcelled for production of eggs and small broilers.

White Leghorn Rooster.

LIVE STOCK

TREATMENT OF SHYING.

Young horses which are being, or have just been, broken in are very apt to shy at various objects and sights until they have become thoroughly familiar with and used to the road or street. Such natural nervousness gradually wears off, as a rule and the shying ceases. No importance need, therefore, be attached to this form of shying in a young horse, as it is natural and quite temporary in character only.

There is, however, a right and a wrong way of treating this kind of shying. The right way is to be gentle to the young animal when it shies, and to allay his nervousness by speaking to it quietly. If it will not pass an object or shows much fear of it, the young horse should be coaxed to it with patience, so that the animal may have an opportunity of familiarizing itself with it, and of smelling at it. Once having done this, and being convinced that its fears are groundless, the young horse will no longer evince any fear of it, and the next time will probably take very little notice of it.

Patience and kindness are all that is needed under these conditions. Unfortunately, but too frequently, the horses are punished with the whip, jabbed in the mouth with the bit and roughly spoken to, being forced past the object by sheer rough treatment; the result being that the animal's fears are much increased, its temper is upset, and increased trouble is experienced next time it shies at something of which it is afraid or which is unfamiliar to it. Such treatment is eminently calculated to spoil the young animal, being apt either to cow it or to rouse its temper and obstinacy. In such cases, young horses actually become confirmed and bad shyers in consequence of such wrong and senseless treatment.

STARTING A BALKY HORSE.

A remedy which will start a balky horse ninety-nine times out of a hundred is as follows: When a horse balks—no matter how badly he balks or how ugly he is—do not beat him; don't throw sand in his ears; don't use a rope on his forelegs or even burn straw under him. Quietly go and pat him on the head a moment; take a hammer or even pick up a stone in the road; tell the driver to sit still, take his lines, hold them quietly, while you lift up either front foot; give each nail a light tap and a good smart tap on the frog; drop the foot quickly and then chirp to him to go. In ninety-nine cases out of a hundred the horse will go right on about his business, but the driver must keep his lines taut and not pull or jerk him back. This may make some horsemen smile, but a horse has more common sense than most people are willing to give him credit for. The secret of this little trick is simply diversion. With kindness and proper treatment a horse can be driven with a string.

TEACHING A COLT TO BACK.

Many experience difficulty in training a colt to back. There should be no difficulty in this if proper methods are followed. After the colt fully understands the legitimate use of the halter in leading is a good time to teach it to back—an important and necessary duty in its after life of usefulness—which is easily accomplished by complying with the natural law again, by pressing the

extended finger of one hand between the point of the shoulder and the breast bone and using the other hand at the halter strap simply to keep the colt straight in line, to back in any desired direction. Don't try to force the colt backward by "yanking" at the halter or bit, but simply press in his sensitive chest cavity with the fingers, and the colt will naturally go backward, provided there is no obstruction behind it. When this pressure has been made at the front and the colt has moved backward (if it is only one step) it should be rewarded for this action; then try it again. About the third time this pressure has been made is a good time to associate the word "back" with the pressure. The trainer will be surprised to see how soon the colt will comprehend what is wanted, and how willingly the young thing complies with every wish as soon as it understands what is wanted.

KICKING IN THE STALL.

For the habit of kicking in the stable, it is a good plan to fasten a chain or strong rope across from post to post behind the animal, about three feet from the floor. A horse almost invariably backs up as far as his halter shank will allow before commencing to kick, and if he cannot get back he is very likely to stand up in his place and behave himself. Another plan is to fasten a chain about a foot long to one hind pastern by means of a strap

HALTER PULLING.

A very good plan to break a horse of halter pulling is to pass the shank through the manger ring and bring it back between the fore legs, attaching it to a rope tied around the body. Another plan is to pass a double shank back through rings on a surcingle, and fasten them to a rope crupper. When either of the above plans is adopted the animal should be urged to pull back which he is not likely to do more than once.

TO KEEP FLIES FROM HORSES.

Take two or three small handfuls of green walnut leaves, upon which pour two or three quarts of soft, cold water; let it stand one night, and pour the whole next morning into a kettle, and let it boil for fifteen minutes. When cold, it will be fit for use. No more is required than to wet a sponge, and before a horse goes out of the stable let those parts which are most irritated be smeared over with the liquid.

TREATMENT OF BROOD MARES.

A moderate amount of sufficiently easy work is in no wise detrimental to in-foal mares during the winter, provided they are treated with proper care, and there is no reason why they should not be moderately worked up to the time they are due to foal. Moderate work serves to prevent the mare from getting fat and to maintain her in healthy condition.

Not only when they are being worked, but also while in the stable, must in-foal mares be treated with extra care and much consideration as soon as they begin to get big. They should not, for instance, be turned sharply round in the stall, but must always be gently backed out of it. When they leave or return to the stable, they should be led through the doorway very carefully, so that they do not scrape against the door-posts with their flanks. Further, the floor of their stall or box should be kept well littered at all times, in order to

obviate the risk of slipping—an accident which is sometimes the cause of ab
tion. In brief, every care must be taken to avoid injury which may have d
astrous results. It is in every case desirable that mares which are heavy
foal should be stabled in a loose-box rather than in a stall, as the former affor
so much more comfortable and roomy quarters than the latter.

Damaged forage may easily prove injurious, and hay which is much mo
burnt is also unfit for in-foal mares. Abrupt changes in the diet must be avoide
nor should the diet be too heating. Beans ought on no account to be fed,
they are much too heating in their effects for mares which are in a forward sta
of pregnancy. The hay fed to the mares should be of the best. They shoul
have plenty of roots—preferably every day. These serve to keep the bowe
in good order, to prevent constipation, to maintain the system in a cool an
healthy state, and to keep the blood pure.

MAKING A ROPE HALTER.

The accompanying illustration shows how to make a simple rope halter
All that is required to make it is a piece of rope and a marlin spike. First decide
on the length of the nose piece. Then
splice a loop in one end of it as shown.
Next at the spot marked for the
other end of this piece raise one
strand of the rope and push the end
without the loop in it through, knot-
ting as shown, then draw tight, leav-
ing the second loop, which is also
shown. Run the free end of the rope
up over the head, through the spliced
loop which comes on the off-side, and
then below the chin and through the
knotted loop on the near-side. This
style of halter will fit any head, and
may be changed as desired by loosen-
ing the knotted loop and shortening
the nose piece. This halter may also
be made by wrapping the loops into shape with twine, but halters so made are
not durable, as the twine tends to wear out quickly. Still for those that can
not splice a loop into the end of the rope the wrapping scheme must serve.

THOROUGHBRED, PURE-BRED AND STANDARD-BRED.

The term "pure-bred" applies to an animal, which is or may be recorded
in a recognized stud book. It indicates animals of well-defined breeding without
admixture of other blood.

The term "thoroughbred" is often used as a synonym for well-bred or
purely-bred animals of any class, but it was originally, and should now, be used
only as the name by which the English race-horse is designated. The same
horses are sometimes denominated "blood horses" from the well-established
purity of their lineage.

The term "standard-bred" applies to the American trotter or pacer eligible
by reason of speed or breeding to registration in the American trotting or pacing
record.

ESTIMATING WEIGHT OF CATTLE.

There are many rules for estimating the weight of cattle by measurement, but one of the authorities on the subject says that "there is no rule that comes nearer than good guessing, and that no two animals will weigh alike according to measurement." The same authority further remarks that a rule, as good as any, is to find the superficial feet by multiplying the girth, just behind the shoulder-blade, by the length from the fore part of the shoulder-blade to the root of the tail. Thus, an ox girthing seven feet nine inches, and measuring six feet in length, would contain seven and three-fourths times six, or 46½ superficial feet. For cattle, grass fed, the following is given as the weight per superficial foot:

Girth less than 3 feet.....11 pounds.
Girth 3 to 5 feet.....16 pounds.
Girth 5 to 7 feet.....23 pounds.
Girth 7 to 9 feet.....31 pounds.

Thus, the steer, as per above measurements, should weigh 46.50 by 31, or 1,441 pounds, gross. Under this rule, it is usual to deduct one pound in twenty on half fatted cattle, from fifteen to twenty pounds on a cow having had calves, and if not fat, an equal amount. The author of this rule suggests its use only when the scale is wanting, as the scale is the only true standard.

DIPPING THE SHEEP.

As soon as practicable—say, when the ewes are shorn—all the lambs should be dipped; and to thoroughly eradicate ticks, the ewes should be dipped also, but in their case the process should be repeated in the autumn. The object of dipping is to destroy the parasites in the fleece, to kill off many young insects which may afterwards hatch out, and to protect the sheep from subsequent attacks. Experience has taught that sheep thrive much better when their skins are clean, and it has been clearly proved that a good dip increases the quantity and improves the quality of the wool. It is absolutely impossible for lambs infested with ticks or other parasites to thrive properly, owing to the constant irritation set up. In trying to get relief, lambs often nibble at the fleece and swallow small portions of wool, with fatal results.

DEHORNING CALVES.

To insure success in the removal of horns from calves, the operation should be performed before the animal is three days old. The calf is caught and laid on its side, in which position it is easily held by an assistant. The hair covering the slight prominence on the frontal bone which marks the spot on the uppermost side of the head where the horn should be developed, were it not interfered with, is clipped off. The operator then takes a stick of caustic potash, dips it in a little cold water, and carefully rubs it over the place just clipped for about ten seconds. The calf is then turned over and the corresponding portion of the frontal bone on that side clipped and rubbed with the moistened potash in the same way as the first. When the side first treated is dry, it is ready for a second application of the potash, which should be used exactly as the first. Follow the same procedure on the remaining side. It is not necessary to rub the skin until blood comes, as is often advised, as it causes unnecessary soreness.

Wrap the caustic in heavy papers to protect the hands of the operator. Do not moisten the caustic too much, so that the liquid will run down the sides of the calf's head, for this will cause unnecessary pain. Fasten the head securely, and apply the potash only on the spot over the horns.

SHRINKAGE IN BUTCHERING.

The shrinkage in cattle depends very much on the way an animal is tened. A steer will also shrink less than a cow. A well-fattened steer o beef breed should dress out from 60 to 65 per cent. of meat. A cow usually figured on making 50 per cent. meat, but that is partly because she is ne fattened like a steer. The usual shrinkage in a hog is 20 per cent. An o well-fattened hog will shrink slightly less, while an old sow, half-fattened, shrink more.

SOWS KILLING THEIR YOUNG.

There are many reasons advanced for sows killing or eating their youn among them being a feverish condition induced by over or improper feedin Corn in quantity is condemned on this account, while a flesh diet is said to exci an appetite for animal food, which is satisfied at the expense of the young one

Thirst has also been adduced as a cause, and it has been recommended tha a supply of water be provided. Constipation and a feverish condition affect th brain, and the excitement attending parturition may add to the evil, and ther is no doubt that the frenzied sow will often then snap at a pig and yet prove kind mother to the remainder later on.

These are conditions to be guarded against, and although they may not h the cure for the so-called vicious sow, attention to the state of the bowels and th general health during gestation, and particularly during its closing days, un doubtedly goes a long way towards preventing the trouble.

Yet another cause—and probably a fruitful one—of a sow killing her young arises from them hurting her teats. The teeth of the youngsters are very sharp, and they are apt to use them, especially when the udders are "caked" and swollen. This leads to reprisals. The sow snaps at the offender, and if she happens to catch him it is bad for the pig. To prevent this injury to the teats, some breeders take off the sharp little teeth with a pair of nippers.

There is no cure for a really vicious sow, and, unless she has some special value, or there are extenuating circumstances to be pleaded in her favor, the sow that has once eaten her young should not be bred from again, but should be promptly fattened out. No sow at any time should ever be allowed a third opportunity of offending.

USE OF LIME IN STABLES.

The practice of lime-washing the interior of the stable, cow-house, pig-pen, poultry house, etc., once or twice a year, is one that cannot be too highly recommended. It not only cleanses and brightens to a degree not obtainable by a coat of paint, but acts most efficiently as a germicide. It is this latter property that gives it an especial value for cow-stables. Undoubtedly, tuberculosis, abortion and the many taints found in milk from dirty stables could, in a very large measure, be prevented and obviated by this means. Progressive dairymen are fully aware of its value in this respect. It not only forms the best covering for the walls and ceilings of buildings containing animals, but is the cheapest. Moreover, in the days of spray pumps it is very easily applied and at little cost for labour. Lime should not, however, be sprinkled on the floors of stables, nor mixed with the manure.

PERIOD OF GESTATION.

The period of gestation in animals varies considerably, but the following is an average period based on a long series of observations:

Mare	11 months	Pig	3½ months
Cow	9 months	Bitch	9 weeks
Sheep	5 months	Cat	8 weeks
Goat	5 months	Rabbit	30 days

KEEPING FLIES OFF CATTLE.

While there is probably no cheap, handy and effectual method of keeping all flies off cows in summer, their ravages may be much reduced by applying to the skins of the animals every alternate morning a little of a mixture of seal or fish oil and crude carbolic acid in the proportion of a tablespoonful of carbolic acid to a quart of oil. It is readily applied with a brush. Another preparation that is highly recommended is a mixture of pine tar and lard in the proportion of one part of the former to ten parts of the latter. It is put on with a cloth, and rubbed down the neck, back, chest and loins, where the flies are the most troublesome. For a spraying mixture that may be made at home, there is perhaps nothing better than coal oil emulsion—a mixture of coal oil and soap suds. This has to be applied every day when the flies are bad, and it evaporates in the course of several hours. A good way of applying a spray is to have a large sprayer, arranged to strike the animal at all points, stationed beside a stall built of poles, having a door at each end, so that the cows can be quickly sprayed and run through one after another.

The ideal summer treatment of cattle, whether dairy or feeding cattle, is to give them access to a darkened barn or shed in the heat of the day when flies are most troublesome. Gunny sacks hung over the windows shut out the light without interfering materially with the circulation of air, and the doors may also be draped with this material.

FREE-MARTIN HEIFERS.

Statistics compiled from the first fifty-four volumes of the Jersey Herd Register show that of the 154,000 cows recorded, ninety-eight were free-martins. Probably many more such heifers were born, but were not recorded because of their supposed sterility. Of these ninety-eight registered free-martin cows, twenty-six had registered progeny. Thus about 27 per cent. of those recorded were breeders and the rest either failed to breed or did not have calves good enough to be recorded for breeding purposes. The interesting thing about it all is that 27 per cent. did breed. This percentage is much higher than has been noted in the experience of observing breeders the country over.

CATTLE LICE.

There are two kinds of lice which live on the skin of cattle and suck their blood. One species, the long-nosed cattle louse, is found on younger animals and is rather more than one-tenth of an inch in length. The other, the short-nosed cattle louse, is somewhat shorter. This latter parasite is especially troublesome on the neck and shoulders of the infested animals, and these parts are frequently worn bare of hair by efforts to dislodge the irritating intruder. Cattle lice infest, especially, animals that are weak or diseased, and when in large numbers

are not easily overcome, but it is worth while to make a persevering effo get rid of them, for they may become a source of great loss. Various subst are used to destroy them. A convenient mixture is kerosene emulsion, w may be sprayed over the cattle and then rubbed well in with the hand or w mop or brush; the cattle should then be kept under cover until they are again. Another mixture which is used with great satisfaction is ordinary l oil with about one-quarter of a pound of surphur to the gallon of oil. A s quantity of this rubbed on occasionally will free the animals of lice. The c stalls should also be thoroughly treated with kerosene emulsion, or simply w kerosene, so as to destroy all lice hidden in the cracks of the woodwork an the walls.

HOW TO CATCH A SHEEP.

A sheep should never be caught by its wool. This method not only cau the animal unnecessary pain, but in the case of fat sheep that are to be kill it does much harm to the joint of mutton that lies underneath where the w was pulled. It causes a dark bruise just in the same manner as our bodies beco discolored from being bruised. The proper way to catch a sheep is to take either by the hind leg just above the gambrel joint, or by putting the hand unde neath its jaw or neck. In using a crook it is important that the sheep are n caught below the gambrel joint, as injury to the leg is liable to result from this.

JUDGING AGE OF CATTLE BY TEETH.

The eruption of teeth in cattle varies somewhat according to the breed feed, precocity or backwardness of the particular animal. As a rule, pampered animals, fed heavily from birth, tend to have teeth come in slightly ahead o average times of appearance. This usually is taken into account in determining the age of show cattle when a dispute arises. The following specifications will aid in gaining an exact knowledge of the dentition of cattle, but the appearance of teeth as set down is most approximately correct for precocious show beef cattle. Eruption of teeth will usually be somewhat later in cattle kept under ordinary conditions. The specifications were prepared by Dr. A. S. Alexander, V. S., when employed as veterinarian to the International Exposition, Chicago, Ill., and were adopted as the standard dentition chart for the decision of disputes and protests:

Twelve Months.—An animal of this age shall have all of its milk (calf) incisor teeth in place.

Fifteen Months.—At this age centre pair of incisor milk teeth may be replaced by centre pair of permanent incisors (pinchers), the latter teeth being through the gums but not yet in wear.

Eighteen Months.—The middle pair of permanent incisors at this age should be fully up and in wear, but next pair (first intermediate) not yet cut through gums.

Twenty-four months.—The mouth at this age will show two middle permanent (broad) incisors fully up and in wear, and next pair (first intermediate) well up but not in wear.

Thirty Months.—The mouth at this age may show six broad permanent incisors, the middle and first intermediate pairs fully up and in wear, and the next pair (second intermediate) well up but not in wear.

Thirty-six Months.—Three pairs of broad teeth should be fully up and in

wear, and the corner milk teeth may be shed or shedding with the corner permanent teeth just appearing through gums.

Thirty-nine Months.—Three pairs of broad teeth will be fully up and in wear, and corner teeth (incisors) through gums but not in wear.

HAY FOR WORKING HORSES.

Horsemen generally have much to learn on the subject of feeding hay to horses. The average man allows the horse to be the judge of how much hay he should have, this being gauged by the animal's capacity, and thus many a good horse is ruined. It may be laid down as a rule that it is never necessary to feed more than one pound of hay for every hundred weight of the animal, For example, a 1,400-pound horse should not get more than fourteen pounds of hay per day.

The above amount of hay and a grain ration composed of corn, oats and bran, mixed in the proportion of one hundred pounds of oats or other grain to twenty-five pounds of bran, will make any horse fit for a hard day's work. One will generally have to feed from one to one and a half pounds of grain per day to every hundred weight of horse. The smaller amount may do when he is at light work and the larger amount when at heavy labor. Such a mixture as this fed along with the amount of hay mentioned will keep a horse cheerful an make him pleasant to work. The grain ration is sufficiently fattening, while it is also flesh-forming enough in character to impart a decidedly wearing quality to the muscles. The bran is used mainly for its laxative action and the feeder will be guided in the quantity of bran by its effect upon the animals. The idle horse can safely be fed rather more bran than when he is working. It is true that some horses will eat much more hay than the amount mentioned, but it is a mistake to increase this quantity, as a horse can only digest and assimilate a certain amount. Keep in mind that his appetite generally goes beyond his powers of assimilation. In many cases horses that eat large amounts of hay become hard-looking, while they have little life or snap in them.

SILAGE FOR HORSES.

There has been little or no experimental work done in connection with feeding corn silage to horses. At the Ontario Agricultural College farm, silage has been fed to a very limited extent for a number of years, and no bad results have been observed. As a rule, roots of some kind are preferred, either turnips or mangels, as these crops are more easily grown than sugar beets or carrots and seem to answer the purpose equally well. When roots are short, silage is used, which has a higher feeding value than roots, but is rather bulky to use as any considerable part of a horse's ration. If used in large quantities, it seems to have a tendency to unduly distend the horse's stomach; but when fed to a very limited extent, no injurious results are noticeable.

RATION FOR FATTENING STEERS.

For fattening steers in a short time, the best grain ration is a mixture of about equal parts of peas, oats and barley. Turnips may be fed liberally if they are available, as high as from forty to sixty pounds per day per bullock. Hay is better to be cut, and if the feeder is especially anxious to hasten fattening the mixing of the hay with pulped roots will be found to make the food rather more palatable and encourage the steers to eat more of it. If the hay is fed

uncut, then slice the turnips. Give the meal ration on either a little cut hay or chaff rather than feed the meal alone. The amount of meal will vary with circumstances and the size of the steers. Steers should be started on a very light meal ration and the quantity gradually increased until they are getting about all they will stand. A steer weighing twelve or thirteen hundred pounds when on a full meal ration may probably take as high as ten pounds of meal per day, but lighter steers would require less. At the commencement, however, they should not get more than three or four pounds of meal in a day, as they are not accustomed to concentrated food of this kind and cannot make use of it. Heavy meal feeding at the commencement of the feeding period is liable to cause trouble in the organs of digestion.

FEEDING VALUES OF FLAXSEED.

Flaxseed may be fed to almost any class of stock, but it should be fed in moderation. For matured cattle or for cattle over a year old, two or three pounds of flaxseed per day is abundance. Generally speaking, it will be found more economical to feed rather less than this quantity. For horses, it should be used in very limited quantity. A good handful of flaxseed per day to a horse should not be too much and will be found beneficial in most cases. Some prefer to mix the flaxseed with oats which are boiled and fed once or twice a week. Fed in this way it generally has a beneficial effect. One or two handfuls of flaxseed mixed with the oats before boiling is plenty. It makes very little difference whether flaxseed is boiled or whether it is fed simply ground. For cattle it is quite unnecessary to boil it, but it is better to be ground. For sheep it may be fed whole or ground, but it might be ground and a little of it mixed with the grain ration.

STRAW COMPARED WITH HAY.

For dairy cows, straw is not generally liked, owing to the fact that the cows are not particularly fond of it. As a rule, too, the ration of a dairy cow requires more protein or nitrogenous matter than that required by most other kinds of stock, and as straw is very poor in protein, it does not make the best combination with ordinary grains for dairy cows. Oat straw is worth more than any other kind of straw, but even this contains less than half as much protein as timothy, and not more than one-fifth as much digestible protein as red clover hay. The amount, however, of carbohydrates or starchy matter in oat straw comes fairly close to that in timothy hay, though it is somewhat lower, and is very similar to the amount in red clover hay. Owing to the fact that a large amount of protein is required in the ration for a dairy cow, under ordinary circumstances oat straw would be worth less than half as much as ordinary good hay, that is, a mixture of clover and timothy. For feeding horses, however, or fattening cattle, oat straw would be worth considerably more than it would for dairy cows.

OATS AND BARLEY FOR FATTENING.

For fattening animals barley has a considerably higher feeding value than oats. One hundred pounds of barley contains approximately 75.9 pounds of digestible nutriments, and one hundred pounds of oats contains 60.7 pounds of digestible nutriments. Barley, however, is essentially a food for fattening animals, either cattle or swine. For dairy cows, oats are very much to be pre-

ferred, for while they do not contain as much digestible nutriments as the barley, at the same time they contain a higher percentage of protein or nitrogenous matter, which makes oats more desirable for dairy cows. For young animals, such as calves, colts, lambs, and even breeding stock, oats are also more desirable than barley, for the reason that they contain a higher percentage of bone and muscle-forming constituents and are less heating in character. They tend to keep an animal healthy and thrifty, without danger of injurious results. Even for fattening cattle, barley is improved by the addition of bran, the bran having a somewhat cooling and laxative effect. For pigs, the palatability of the barley will be found to be improved by adding wheat middlings. It will be seen, therefore, that there is more to be considered in the selection of foods than the mere amount of nutriment which they contain, and this fact renders it difficult to make accurate comparisons of any two foods.

FEEDING VALUE OF SUGAR BEETS.

Sugar beets, like other root crops, make an excellent addition to foods for cattle, sheep and pigs. They are succulent and nutritious, keep well over winter and form a welcome addition to the dry food of stock, keeping the animals in good health and maintaining the flow of milk. The following table shows the comparative feeding value of sugar beets, mangels and silage:

	Dry matter.	Protein.	Carbohydrates.	Fat.
Sugar beets...	13.5	1.1	10.2	0.1
Mangels.....	9.1	1.1	5.4	0.1
Silage.....	20.9	0.9	11.3	0.7

This table shows that, as far as chemical composition is concerned, sugar beets are somewhat richer than mangels, although experiments have indicated that all common root crops are equally valuable as food for animals if equally palatable. The beets are not so rich in total food constituents as green corn fodder and silage, but it must be borne in mind that the beets are practically completely digestible, while only from two-thirds to three-fourths of the dry matter of corn fodder and silage is digestible.

Extended experiments in Denmark have indicated that roots of any kind should not constitute more than 40 per cent. of the ration of pigs. It is probable that this proportion should not be exceeded with other animals, although larger proportions have been fed to cows without injurious effects.

BUCKWHEAT AS STOCK FOOD.

The grain of buckwheat has a fair feeding value for all classes of live stock. Its nutrients run somewhat lower than the leading cereals. In a hog-feeding experiment conducted at Ottawa, a mixture of half buckwheat and half barley, rye and wheat gave greater gains than buckwheat alone, or wheat alone, and almost as great as a mixture of wheat, barley, rye and bran. Buckwheat mixed with other grain in equal quantities is especially good for milch cows and hens, and it is also valuable for conditioning horses for market, but the flesh is said to be soft for heavy work.

FOOD FOR GROWING PIGS.

The amount of feed necessary to produce one hundred pounds live weight in hogs varies extremely. There are cases where it required rather less than four pounds of meal for one hundred pounds increase in weight where nothing

but meal and water were fed. In other cases it may require between five an six pounds of meal for one hundred pounds gain. A great deal depends upo the natural thriftiness of the pigs and the skill with which the feeder is able t handle them. For pigs that have reached a weight of eighty to one hundre pounds, kitchen refuse answers very nicely, and will reduce the amount of mea necessary for one hundred pounds gain to a very large extent. In fact, in som cases where kitchen refuse is fed, the amount of meal may be reduced to les than two hundred pounds for one hundred pounds gain. For very young pigs however, the kitchen refuse will not be found so satisfactory, and it will be neces sary to feed them easily-digested food in order to give them a start. For youn pigs just after weaning, there is probably nothing better than wheat middling and skim milk or buttermilk. A very small quantity of ground oats can b mixed with the middlings, but only a limited quantity of oats is desirable i the ration for a pig under any circumstances, unless it is for matured breedin animals. Oats are too bulky and fibrous to constitute a good fattening ration for pigs. Barley does very nicely for fattening hogs, and may be introduced after the pigs have got well started, though it is not advisable to feed much barley to pigs under ten or twelve weeks old.

SALT IN STOCK FEEDING.

Domestic animals living in the vicinity of the sea do not show any fondness for salt, neither do those animals care for it that live on feeds containing a good deal of salt, as salt hay and the like. On the other hand, inland animals, and especially animals heavily fed, show a great fondness for salt. In view of what we know on the subject and of the experience of stockmen, it would seem best to go on using salt in reasonable quantities with farm animals, though it is doubtful if it is wise to supply all that the animals will eat at all times, or in other words, to keep salt before them continuously, as is the custom of some feeders. Hard-worked animals, which of necessity must consume unnaturally large quantities of feed in order to gain a desired nutriment, may be aided in their effort by the addition of salt to the ration. A horse which must eat a great quantity of grain each day because of the heavy work performed, a dairy cow giving a large flow of milk and a fattening steer taking from a peck to a half bushel of grain into his paunch daily—all of these animals may be aided in their efforts at digestion and assimilation, it would seem, by the action of salt. Wild animals and those living more naturally may do without salt much better than those in the condition just described, which is far from being natural.

FEEDING CALVES AND PIGS ON WHEY.

Whey for calf feeding should always be given sweet and as warm as new milk, and to it should be added flax meal or oil meal boiled to a jelly. A calf two months old should receive twice daily from one to two quarts of the boiled oil meal porridge mixed with about three quarts of warm, sweet whey. If bowel trouble presents itself the quantity of porridge should be reduced. The calf should also be given dry oat chop and bran, also grass or good clover hay. Young pigs fed on whey should also receive fine shorts or finely ground barley in the form of a slop. They should also have green food in the form of weeds, clover, etc. Care should be taken not to overfeed either calves or pigs on whey, as when fed in too great quantities it is liable to produce digestive derangement.

WEANING THE PIGS.

Pigs should never be weaned until they are two months old, and if the sow is not needed for farrowing again soon, it is better to let the pigs nurse to the age of two and one-half months and even three months. The best way to put gain on a pig is through its dam. She has the ability to digest many things that the pig cannot, and can turn grain, grass, rape and many other things into milk to feed the pigs, which in turn change it to bone, muscle and fat, which is gain to the farmer. It is known that each pound of weight taken from the sow will make something like one and one-quarter pounds in the pigs.

The sow should be well fed after the pigs are a few days old on grain and milk-producing food, and should have a good pasturage in its season, or cut clover, rye, rape and roots in their season. When the time comes to take away the pigs—and it is doubtful whether this time comes before the sow shows inclination to wean them herself—the sow should be put on some dry feed that does not have milk-producing properties and a few of the pigs should be taken from her at a time. It is best to take the strongest first. This gives the weaker ones, if there be weaker ones, a better chance, and it also dries the sow up gradually and does not allow the cake to form in her udder, as is often the case when the pigs are all taken from her at once and her usual rations are kept up as before weaning the pigs. When first taken from their dam the pigs should be fed several times a day, as they suck often while running with their dam and a radical change may prove detrimental to some of them, but when they get started in the new way of living th meals may be cut to three times a day, and later to twice. But they should, at all events, have the run of pasture, if possible.

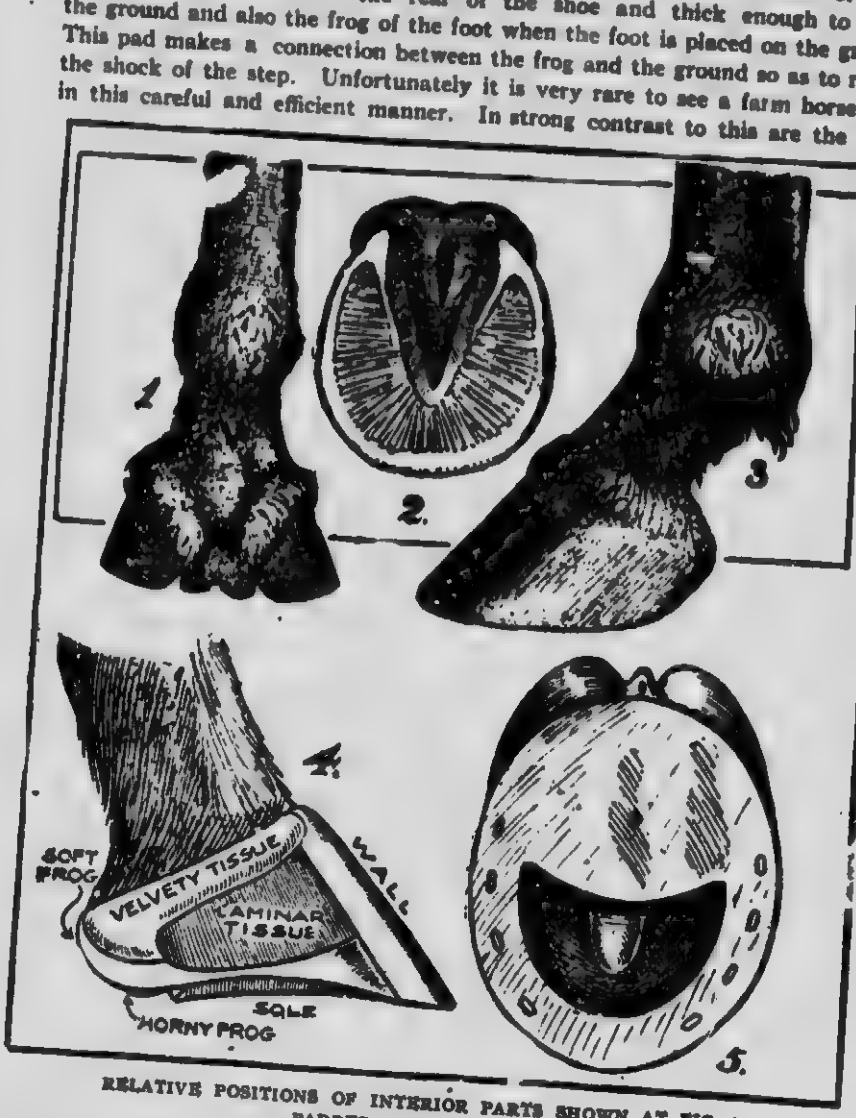
THE FOOT OF THE HORSE.

In a state of nature the hoof preserves its form and its qualities under the following conditions: The elasticity is complete when the frog is in full contact with the ground. Its proper use maintains a proper length at a regular width. The sole has all its thickness, all its strength, and prevents the contraction of the heel. The varnish of the wall protects the horn from alterations from dryness or wetness. The moisture of the soil, the dew and the freshness of the pasture maintain in it a moist condition, favorable to the preservation of its proper form, and the performance of its functions.

In the illustration there are shown three views, 1, 2, and 3, of a well-shaped hoof of a horse which has not been damaged by improper shoeing. These views are from the side, the rear and from beneath. Especial attention should be given to the frog of the foot, as shown in the rear view. In the natural, unshod foot the frog extends clear to the ground. Then when the foot is placed on the ground in travelling, the hoof spreads behind and sinks until the frog rests firmly on the ground. In this way the frog performs two functions: It acts as a cushion to soften the shock of the step. It acts much like a rubber heel on a shoe to prevent slipping. This is especially noticeable in the front foot, for the front feet of a horse carry a greater proportion of the animal's weight than do the hind feet; the front foot is set down with more of a "slap" than is the hind, and is also set down heel first instead of toe first.

Here is where the average blacksmith makes his greatest mistake in shoeing a horse, especially a driving or a riding horse. The frog is trimmed small and close, and high rear calks are put on the shoes so that the frog is unable to perform either of these functions of cushioning the step or preventing slipping. Of course, the calks of the shoe on a rough-shod horse will prevent slipping, but

they in no way cushion the shock of the step. Riding and driving horses
are properly shod so as to permit the frog to perform its important duty of cu
ing the shock of the step, have a spongy pad of some sort—hard rubber or
soft leather—fastened to the rear of the shoe and thick enough to
the ground and also the frog of the foot when the foot is placed on the gr
This pad makes a connection between the frog and the ground so as to r
the shock of the step. Unfortunately it is very rare to see a farm horse
in this careful and efficient manner. In strong contrast to this are the



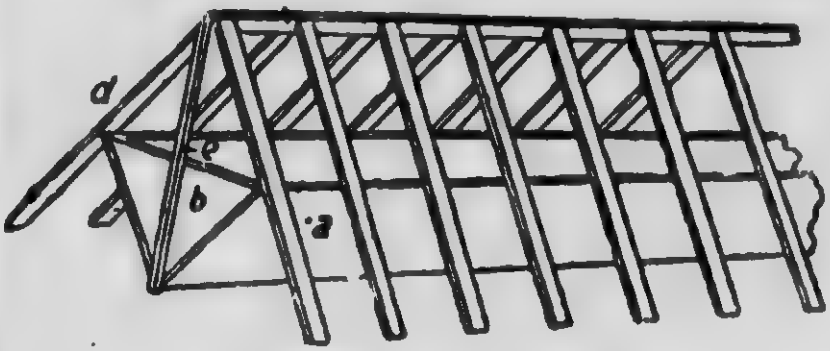
RELATIVE POSITIONS OF INTERIOR PARTS SHOWN AT FIG 4.
PADDED SHOE AT NO. 5

seen on the feet of a horse of a w equipped mounted city police force. This mistake in the shoeing of driving and riding horses is largely responsible for most of the wind galls, splints and side bones found on such horses, especially those which "pound" with their front feet as they travel.

Horses which are used entirely in the fields during the open months of the year are generally better off if not shod at all This is especially best when working on soft or muddy ground, for there is considerable danger of their over reaching and "calking" themselves. If they are shod at all, they should be smooth-shod to prevent this "calking."

GUARD FOR PIG TROUGH.

To prevent hogs getting their feet into trough, the arrangement shown here is effective. The width of the side boards will depend upon the size of the hogs to be fed. A small trough with 6 inch side boards may be used for the small pigs, and 12 to 16 inch for the breeding sows. The size of pieces C and D will be regulated by the width of the animals and the strain likely to come on the



PREVENTS WASTE OF FEED.

frame. For pigs of ordinary weight a piece 2 by 4 inches should be used for the ridge pole and pieces 1 inch by 3 inches or 2 inches by 2 inches for the guard bars D. These should be securely nailed to the side of the trough, and, if it is a permanent trough in the pig house, have them spiked to the floor to prevent breaking off. The upright E firmly spiked to B secures endwise rigidity. For delivering slop to the trough a spout is arranged to enter at the end of the feed trough.

CURING PORK.

The meat, after being freshly cut up, should be allowed to lie in a cool airy room for about two days, during which time it should be lightly sprinkled with fine salt or saltpetre, applied with a shaker. This removes the surface blood and leaves the meat fresh and clean for the reception of the curing ingredients. In winter, the meat must not be allowed to freeze during this interval, as meat that is frozen will not take salt nor keep from spoiling if salted. Moderately cold and damp weather provides the best and most absorbent state for the curing ingredients to do the work. Care must be taken to see that these are evenly applied, and that they enter every depression and interstices about the joints. While being cured, the pieces should be frequently turned and rearranged, if in layers, to insure an equal exposure of all parts to the action of the curing ingredients.

Dry Salting Pork.—For 100 lbs. of pork use 4 qts. of salt, ¼ lb. brown sugar, and ¼ lb. of saltpetre. Neither the sugar nor the saltpetre are absolutely necessary, and both are often omitted, but both are preservatives, while the sugar serves to improve the flavor, and the saltpetre imparts a finer color, and adds to the firmness, if used sparingly; otherwise it will harden the tissues. When these ingredients are used, first apply a teaspoonful of pulverized saltpetre on the flesh side of the hams and shoulders, then, taking a little sugar in the hand, apply it lightly over the flesh side of all the pieces. A tablespoonful will be enough for any one piece. Then apply the salt thoroughly to all parts of the

meat. If the meat is rigid, rub the skin side as well, as this makes it penetr more deeply. Place the piece on a table, slightly slanted to carry off the dra age, and lay them in layers, keeping a slight sprinkling of salt between the laye The hams require less salting and should be reserved for the top, since the m has a tendency to settle. In from ten days to three weeks, according to t size of the pieces, break the bulk, and re-salt, using the same salt again, wi a little new salt added. In about four weeks more break up, and wash the mea nicely from all adhering salt, preparatory to smoking it. The meat receiv smoke better and looks nicer if washed, but if it is preferred to hang it witho smoking, this may be omitted.

To Cure Pork in Pickling Brine.—A general cure which serves to mak fine ham and bacon, pickled tongues, etc., includes the following: For eac 100 lbs. of meat, use 7½ lbs. of fine salt, 2 lbs. of refined sugar, and ¼ lb. o saltpetre. Rub the meat well with this mixture, and pack closely in a cask Cover the meat with about ten gallons of cold water, and place a weighted cover on it to keep the meat well down. In about three weeks drain off the brine, and re-boil to insure it against impurities and add original ingredients to re- furnish the quantity; replace in the cold brine for about four weeks longer, after which the pieces may be washed and hung to dry and smoked or stored.

Not infrequently, from insufficient care in cleansing from surface blood, unclean barrels, etc., the brine becomes malodorous and the contents of the pork-barrel, if not given immediate attention, become unfit for food. As soon as the trouble is discovered, remove the meat, wash it thoroughly, and soak in clean water until fresh and sweet. Cleanse the barrel by scouring with hot water and wood ashes; re-boil the brine for half an hour, skimming off the im- purities that rise, then allow to cool. Replace the meat after sprinkling it with a little fresh salt and re-cover with the brine, and if due care has been given no further trouble will be experienced, and the meat will be sweet and firm.

RAISING A FOAL BY HAND.

Milk for a foal should always be taken from the same cow, and one that has not been long calved. The milk should be diluted with one-fourth its volume of water; it should be sweetened with sugar and always be fed at blood tempera- ture. The foal should be fed at least six times in twenty-four hours during the first three months, and care must be taken not to over-feed; there is more danger of over-feeding than under-feeding at this time. One pint at a feed should not be too much for a strong foal. As the foal grows older less water should be added to the milk. Gruels may be made by boiling beans or peas and removing the skins by passing them through a sieve. Oil meal made into a jelly by boiling and shorts prepared in the same way are excellent for a motherless foal. When the foal is about three weeks old it will commence to eat. It should be given grass, oat chop and wheat bran. Care should be taken to keep the feed boxes clean and sweet at all times.

COLOR OF THE SHORTHORN.

Shorthorn cattle are frequently referred to as the "reds, whites and roans," as these are their standard colours. Red and dark roan are most in favour. White is not considered objectionable, and red and white spots alternating are not in favour, although such marking is not an indication of impure breeding. All shades of roan are admissible. The skin around the eye and bald of the nose should not be dark or clouded, but of a rich cream colour slightly pink.

SUMMER FEED FOR YOUNG PIGS.

Pigs that are born the middle of May will not make much use of pasture before July. To provide good feeding it is well to sow one plot with peas and oats and another with rape. Sow the oats and peas first thing in the spring so as to have them in shape for feeding at an earlier date than would be obtained if another crop were first sown and pastured off. The rape can be divided into two lots and the pigs changed from one lot to another, giving the rape a chance to make a growth in the meantime. If peas thrive in the district, it is well to sow quite a large proportion of peas along with the oats, say, about equal parts of peas and oats. Fifteen or twenty pigs could be given a fair amount of pasture on an acre, but, of course, they would need other foods. It is out of the question to raise pigs upon pasture of this kind alone, and it would be necessary to feed a light grain ration along with the pasture. At first when the pigs are comparatively small, a liberal meal ration will have to be fed, but when they get old enough to eat the pasture freely, about half of a full meal ration could be used to advantage.

PREPARING WOOL FOR THE MARKET.

To ensure cleanliness the wool needs to be absolutely at shearing and the floor clean and smooth. Before rolling fleeces they should be lightly shaken to remove all loose dirt and double-cut fibres. All heavy tags or badly discolored locks should be removed. The fleece should then spread on the floor or table with the skin side down. The outside edges are then folded over to the center line of the back and the one half of fleece again folded over to the other. Commencing at the tail, roll the fleece as compactly as possible to the neck.

In the coarser grades of fleeces the neck wool may be twisted and drawn into a band which is wrapped around the fleece and tucked in securely to hold the bundle together. With shorter grades this cannot be done, and it is necessary to tie with twine.

Never use binder or sisal twine for this purpose as the fibres adhere to the wool, greatly reducing its value. If possible, use the regular paper twine, but if this is not available use any strong, hard, smooth finished twine, wrapping at least once each way, and tying securely in a square knot. When properly rolled and tied, the bright side of fleece will be on the outside of bundle.

MILCH GOATS.

The milch goat, which is perhaps the most popular in the United States, is the Toggenburg, one of the leading breeds of Switzerland. This goat is brown with white markings, a typical feature being a white streak down each side of the face. Both short and long haired varieties are found, while horns are generally absent, and a beard and wattles are common. Animals of this breed are of medium size, the does at maturity weighing about 125 pounds. They are quite hardy and the does are good milkers and excellent mothers.

The Saanen is another breed of Swiss origin and in color they are white or creamy. They are generally short-haired and hornless, though horns are sometimes present and long haired animals are found. The animals of this breed are large, the does averaging about 145 pounds in weight. They are good producers, but do not yield as heavily as do Toggenburg does and probably three quarts per day is a good average production. A Toggenburg doe in New York produced 1,845 pounds of milk during a lactation.

HORTICULTURE

APPLE GROWING

The best-flavored, most highly colored and longest-keeping apples produced in Canada, and if the Canadian apple grower does his part well should be an abundance for home consumption as well as for export. As and harder varieties are introduced, the area of successful apple productio gradually widening. In all the settled parts of the eastern provinces and Br Columbia it is possible to grow apples, and in the prairie provinces hardy s are being planted to some extent. Some varieties begin to bear paying c when five years planted. There are others (including the best sorts) that do bear heavily until ten or twelve years. In the most favored districts, when climate is not too severe, an orchard will continue to bear for fifty years or m There are Gravenstein trees in the Annapolis Valley over a hundred years old

LOCATION OF ORCHARD

For the home orchard the location will be largely determined by the site the house. Only in exceptional cases should the planting be done at a distan from the home where it can constantly be under the eye of the owner, where t fruit may be convenient for the family and where all the interesting stages blossoming and ripening may be watched. If there is room for choice as to s and slope, take into consideration first the prospects for good drainage. A slop or even a hillside provides natural drainage, and, if not too much exposed to hig winds, will be suitable. Trees planted on a southern or south-western slop are subject to sunscald, and in the prairie provinces are liable to be brought int bloom too early by warm days in April and thus exposed to danger of frost All things considered, a north-eastern or eastern slope is to be preferred. Sandy loam and clay loam soils are the most suitable, though gravelly or even sandy soils will give results under good management. Land that has been exhausted of much of its plant food by growing grain or other crop is not suitable for apple growing unless improved by plowing under clover or applying farmyard manure

PLANTING FRUIT TREES

Fall planting is often recommended, and in parts of the United States is quite as satisfactory as spring planting. In Canada, however, the safest practice is to order trees early, have them delivered in good time and plant before growth begins. If the roots are dry when received from the nursery, a good plan is to cover them entirely with water for about a day and a half when they will be revived. To give the young tree a good start, moisture must be provided after planting. For this reason soil needs to be well prepared and plenty of humus supplied around the roots to prevent drying out. With the surface stirred every week to keep a fine mulch it should not be necessary to apply water. Should there be a prolonged dry spell, a few good waterings will save the trees.

The distance apart that apple trees should be planted will vary according to the varieties used, the locality, the land at the planter's disposal, and the other purposes, if any, for which he intends to use the land. In order to thrive best and produce fruit of good size and colour, the trees should have abundance of sunlight and air, and they cannot obtain these if planted too closely together.

Spraying has become such an integral part of successful fruit growing that sufficient space must be left between the trees to permit of doing this work thoroughly. When planted closely injurious insects and fungous diseases are more prevalent than where there is abundance of light and air.

In the best apple-growing districts of Ontario and Nova Scotia, most of the winter varieties should be planted from 35 to 40 feet apart each way. This seems a great distance when the trees are young, but they will continue to bear profitable crops for many years when trees planted much more closely will have ceased to bear good fruit. In the colder parts of Ontario, the province of Quebec, New Brunswick, Northern Nova Scotia and Prince Edward Island, 30 to 35 feet apart each way is a good distance. In the prairie provinces 20 feet apart each way is sufficient. In British Columbia 30 feet apart each way is a satisfactory distance. A growing practice now-a-days, and one which is giving good satisfaction, is to plant what are called "fillers" between the permanent trees. These are early, heavy-bearing varieties, such as Wealthy, Duchess and Wagener, which begin to produce profitable crops of fruit when very young, and which may be removed when they interfere with the permanent trees. Other fruits, such as plums, cherries and peaches, may also be used for this purpose, but are not as satisfactory as apples as they are not sprayed at the same time.

The same general directions for planting apply to other fruit trees. The distances apart are approximately as follows: Dwarf apples, 10 to 20 feet; standard pears, 20 to 30 feet; plums, 16 to 20 feet; cherries, 18 to 25 feet; peaches, 16 to 20 feet.

At 10 feet apart, 430 trees can be planted on an acre; at 15 feet, 200 trees; at 20 feet 110 trees; at 30 feet, 50 trees.

CHOICE OF VARIETIES

Do not indulge in novelties or untried varieties. In the colder districts special care is to be taken to get hardy sorts only. The word of the nursery agent on this point is not sufficient. Apply to the Central Experimental Farm at Ottawa or to the Agricultural College of your own province for information with reference to your own particular district. For Southern and Western Ontario, the old standard varieties, Baldwin, Greening, Spy and Golden Russet, are the best winter varieties, and should form the main part of the orchard. For the Ottawa and St. Lawrence Valleys and the Southern portion of Quebec, nothing is better than the Duchess, Wealthy, McIntosh Red and Fameuse. These will form the bulk of the orchard. For the favoured portions of New Brunswick, the same varieties will be grown, with possibly the addition of Scott Winter, Canada Baldwin and Wolf River, though the quality of the last named is only fair. Nova Scotia is making most money out of the Gravenstein, Baldwin, Spy, King, Blenheim, Orange, Golden Russet and Nonpareil. Prince Edward Island requires something slightly hardier, perhaps, and will do better to stick to the Duchess, Wealthy, Baxter, McIntosh Red and Fameuse.

In British Columbia the adaptability of varieties has not been so well established. Those that are suitable in almost all districts are Wealthy, Duchess, Gravenstein and McIntosh Red. Crab apples are specially adapted to the climatic conditions of the Pacific Coast.

In addition to these varieties, all excellent for home use, it is desirable that a few trees should be added that are specially adapted to home use and, perhaps, to the local markets; and in this class only suggestions can be made. For instance, a tree or two of the Yellow Transparent, Red Astrakan or Lowland Raspberry will be planted in order to have the earliest varieties.

APPLES FOR THE PRAIRIE PROVINCES.

Best results from fruit trees on the prairies have been in localities w there is natural protection from trees, hills or even from fences. There doubt that in time a considerable number of varieties will be developed are hardy enough for the sourthern parts of the three provinces. For the favored situations, the foliowing are recommended: Blushed Calville, Anis Duchess, Charlamoff, Lowland Raspberry, Beautiful Arcade (Repka Kisl Patten (Greening), Antonovka, Hibernal.

Crab Apples.—Transcendent, Florence, Virginia, Hyslop.

Saunders' Hybrid Crab Apples.—Jewel, Charles, Silvia, Prince, T Robin, Elsa and Norman. These are about the size of other named crab ap but hardier.

DWARF AND STANDARD TREES

The dwarfing of fruit trees is accomplished by budding or grafting rob growers on slow-growing stocks, and most fruit trees lend themselves to t treatment. In proportion to size, dwarf trees are more fruitful than standar though the yield per acre is not likely to be so great. They come into beari sooner and are therefore of special value in many cases; and by reason of th small size they can often be grown to advantage where standards might impossible.

There are two types of dwarf apples which are used for stocks, known the Paradise and the Doucin. Nearly all the dwarf apple trees in this countr however, are propagated on the Paradise stock. Most of the stock is grown France, where our nurserymen procure their supplies. The stocks are commonl grown by mound layering, that is an established tree is cut off to within a fe inches of the ground and the stub is covered with earth. Numerous suckers a thrown out, which take root in the mound of earth. When well rooted, they a taken up and set in nursery rows.

The pruning of dwarf trees must be more severe than that of standards i they are to be kept small. This will also result in more bearing surface an the fruit buds will be more evenly distributed over the entire tree rather tha at the top.

PRUNING APPLE TREES

Trees will bear fruit without pruning, but it is often small in size and not so attractive. It does not exhaust a tree as much to bear a good crop of fine fruit as it does to produce a heavy crop of small fruit, as the exhaustion of the tree is more in proportion to the number of seeds matured than to the size of the fruit. If much pruning is done at one time it would be likely to injure the tree. When the tree begins to grow thriftily many new branches will be formed, and it is the work of the pruner to remove all those which are not necessary and to cut back others. The top of the tree should be kept open, to admit air and sunlight, but pruning should be so carefully done that there will be no bare limbs. Most of the fruit will be borne on fruit spurs or short woody branches on the larger branches; and if the top of the tree is very dense these do not develop well. In Eastern Canada, however, there is now a tendency to do comparatively little pruning for the first few years after planting, the object being to bring the trees into bearing sooner than if trees are pruned heavily every year. If the main branches are limited to three or to five at the outset the tree will not become too thick for some time with a very little pruning each year. It is best to prune

from the outside of the tree as much as possible, rather than from the inside, as the work can be done there with much better judgment. In order to keep the lower branches vigorous the leader is sometimes kept headed back somewhat, so that there will be more growth on the other branches.

A bad practice in pruning and a very common one is to leave the stub remaining of the branch cut off. In many cases this never grows over, rot sets in and reaches the heart of the tree. A clean, close cut will heal quickly and needs no paint or wax unless a large limb has been removed. If large limbs are removed the wounds should be given a coating of white lead paint, which will protect them from weather and prevent rot from setting in until they begin to heal over.

It is generally believed that winter or spring pruning tends to the production of wood; and summer pruning, to the production of fruit buds. The reason for this is that pruning before growth begins, or when it is beginning, destroys the balance between top and root, and there being then more sap supplied by the roots than the remaining top can elaborate, stronger growth is made or new branches formed to readjust this balance, but injudicious summer pruning may result in less fruit. If pruning or pinching off part of the new growth is done in the summer after most of the growth has been made, a part of the elaborated sap, which is as necessary to the production of strong roots as it is to the production of top, is removed, and the tree is checked in its growth and somewhat weakened, although the pruning should not be so severe as to make the latter apparent. Summer pruning to produce fruitfulness is, however, seldom necessary. Root pruning, which also tends to weaken the trees and promote favourable conditions for the development of fruit buds, is sometimes advocated, but this likewise is seldom necessary. This is done by digging around the trees, and thus destroying part of their roots. Anything which checks the downward flow of sap in healthy trees seems to favour fruitfulness. A branch which has been injured will bear before another. A top graft, in which the free downward flow must be checked at the union, fruits earlier than a standard tree.

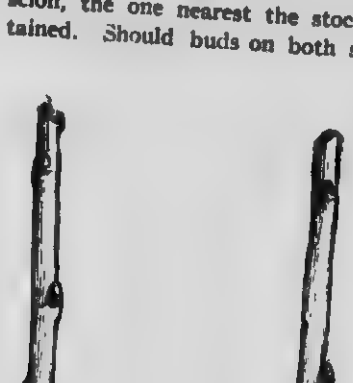
GRAFTING

CLEFT GRAFTING.

There are two methods of grafting commonly employed—cleft-grafting and tongue or whip-grafting. The ordinary method is what is known as cleft grafting and is employed principally with apples and pears, but may also be used with plums and cherries. The best season for this operation is the spring. Plums and cherries should be worked first, for it is very important that these should be grafted before any growth takes place. Pears and apples may be grafted a little later but the scions ought to be set before the leaves unfold.

The operation of cleft-grafting is conducted as follows. The branch is sawed off at the point where it is desired to insert the scion; it is then cleft and the scion is set in so that the growing part or inner part of the bark is directly opposite that of the stock. The scion should be cut in the form of a long thin wedge. The cleft and the cut end should then be covered with wax so as to

exclude water and prevent evaporation. If there are several buds
scion, the one nearest the stock is most likely to grow and should
tained. Should buds on both scions grow, one may be removed.



TONGUE OR WHIP GRAFTING.

Tongue or whip grafting is em
with small stocks and in grafting se
apple roots with improved varieties.
scion and the stock should be near
same size. The parts are held firm
place by wrapping them with c
yarn drawn through melted wax
whip or root-grafting apples, th
one-year-old stock is taken up in
fall and stored in a cellar. During
winter these roots are cut in two
three pieces and each grafted with
scion. They are then packed in m
earth until spring, when they are set
in the nursery row.

In a cold climate it is better t
the scions intended for grafting should
cut in the fall, because if left on the tr
over winter, there is a possibility of th
being injured by severe freezing.
course this possibility will vary consid
ably with varieties. The main points
observe in all grafting operations are
have a sharp instrument that will ma
smooth clean cuts, and to have the inn
barks of scion and stock in perfect contac

GRAFTING WAX

There are many kinds of grafting wax recommended, but it is unnecessary
to enumerate them all. One of the cheapest and best is made as follows:—

Resin, 4 parts, by weight; beeswax, 2 parts; tallow, 1 part. Melt together
and pour into a pail of cold water. Then grease the hands and pull the wax
until it is nearly white. One of the best waxes for either indoor or outdoor use.
This should be heated before using if too hard.

Another and more pliable wax for outdoor use is made in the following
proportions: Resin, 5 parts by weight; beeswax, 1 part; boiled linseed oil 1¼ parts.

The principal value of grafting wax is to exclude air from the wound, and
thus prevent the wood from drying before a union takes place. A good grafting
wax should not crack when on the tree, else the air will reach the wound and the
wax prove of little value. Many materials may be used instead of grafting wax
for this purpose, one of the simplest being a mixture of clay and cow dung, but
grafting wax is much to be preferred. Strips of cotton are often used, especially
in top-grafting and crown-grafting, for wrapping around the wound after the
wax has been applied, for the purpose of helping to exclude the air, and also to
assist in holding the scion in position until the union takes place. This cotton
is unnecessary if good grafting wax is used; but if a very valuable variety is grafted
it is safer to use the cotton, as when the growth of the scion is rapid, there is a
chance of its getting broken off during the first season before it is thoroughly
united with the stock.

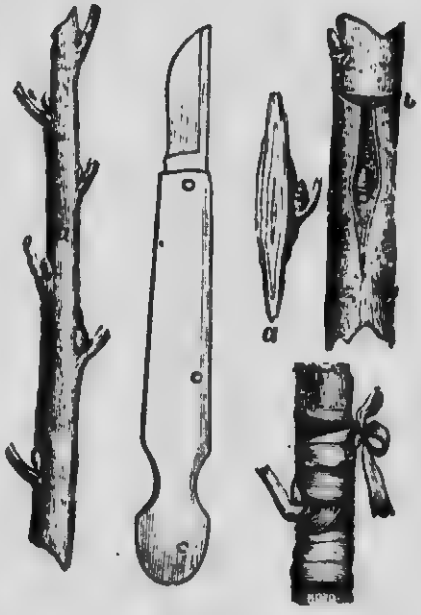
RENEWING OLD ORCHARDS.

Altogether the most profitable orchards are those set in recent times, or at least put out in the modern method. They are composed of strong, healthy, vigorous trees which practically cover the ground and among which there are no blanks. On many farms, however, there are smaller or larger tracts of old orchards, many of which are worthless and many more of which are not distinctly profitable. Some of these old orchards could be rejuvenated. They could be brought into reasonably good bearing and to a point where they would really pay a profit. The rejuvenation of an old orchard is a fairly simple matter, providing it is properly understood. The important point is that it does not consist in the application of any single patent remedy. Spraying will not do the work; pruning will not cure all the troubles; tillage alone will be worth very little; the only way to get the desired result is to apply proper methods all along the line. The soil should be loosened up and proper drainage provided. The trunks should be scraped clean and old dead limbs should be cut out. A reasonable, but not excessive, pruning should be given. Thorough spraying should be undertaken. In case the trees are of mixed or unprofitable varieties, they should be grafted to standard sorts. It is not likely that additional plant food will be required at first, except on soils very much depleted. An orchard taken vigorously in hand in the matter of tillage, pruning and spraying is apt to start into a strong growth at once; and if a good deal of raw fertilizer is applied, there may easily be more growth than is desirable. However, one must keep his eyes open, and in case the trees show the want of more food, it should be given. It is really a comparatively easy matter, if all these things are systematically attended to, to bring an old orchard round. It requires from two to five years to do it, depending on the condition of things when the matter is taken in hand.

BUDDING FRUIT TREES

Budding consists in taking a bud from one tree and inserting it under the bark of another tree. It is used to take the place of grafting, and is practised in a commercial way in propagating peaches, plums, cherries, roses and certain varieties of ornamental trees and shrubs. It is essential that the bud and stock unite freely. To have this occur the cells of the cambium layer of the stock must be in state of active division, indicated by the ready separation of the bark from the wood. The union of the two, the bud and the stock, takes place at the edges of the bark of the inserted bud. For this reason the bud should be inserted as soon as it is cut from the twig to avoid dying.

In climates having severe winters budding is most satisfactory when performed near the end of the growing season between July 15th and Septem-



PROCESS OF BUDDING.

ber 1st. The buds should be plump and mature when taken fro
shoots of the current year's growth. The "bud stocks" should be cu
day the buds are to be inserted, trimmed and wrapped at once
damp cloth to prevent drying on. Trimming consists in cutting of
leaves, saving a bit of the stem to use as a handle in inserting. In
ting the buds, use sharp knife; insert blade of knife one-fourth inch b
bud. cut upward just behind bud, removing but little of wood, co
out about one-fourth of an inch above bud. (See Fig. a.)

To insert bud, make T-shaped incision in stock about two in
above ground. (See fig. b). With the spatula of budding knife loosen the
of bark in angle of the T cut and slip in the bud. (See fig. b.) The bud n
be held firmly in place by a bandage wound above, and below, being car
to leave the eye of the bud uncovered. Raffia fibre (wet), bast, candle w
or waxed cloth may be used for tying. Raffia is usually employed. If
bud "takes," remove the bandage in about ten days by cutting loose on b
side of stock to prevent the hindering of growth of bud. In three or four we
cut off the stock just above bud to stimulate the growth of new bud.

CARE OF YOUNG ORCHARD.

In the usual instructions for planting, long chapters are devoted to fille
The fact is, that only one man in a thousand can make a success of using fille
in an ordinary orchard. Use the ground between the trees for ordinary cro
the first few years. Keep a strip of three feet on each side of the trees tho
oughly cultivated. Widen this strip a foot a year, and use the ground betwee
for any crop that will fit in with a rotation. By preference, it would be bette
to use a crop that would be sown rather late and that will not be high enoug
to cast any shade. The ordinary grain crops are not so good as a hoed crop.
there is any market for small fruits, green corn, squash, garden truck of any
sort, this will be the place to grow it. Field beans are a splendid crop to fill i
between trees. The first year, corn makes a good crop, and potatoes, if not
grown too close to the trees, are an excellent crop.

Everywhere it is advisable to have clean culture about the trees during the
growing period of May and June. A cover crop should be sown the last few
weeks of July, on this cultivated strip about the trees, and allowed to remain
all winter, of course. This cover crop is a most important thing with trees
somewhat tender or in the colder portions of the country. The good culture
which the trees should get is apt to induce a vigorous growth, and this growth
of root and branch is much more tender than the slower growth and better
matured growth of an uncultivated tree. Cover crops, then, are the comple-
ment of clean culture; and there are large sections of the country where clean
culture is not advisable unless there is the greatest care used in following it
up with a proper cover crop. The first pruning should be done with a view of
forming a top that will be well balanced, that is, that will throw out a branch
in three or four directions, filling the whole circle at the top. This cannot be
done always the first year. Plan to do it the second year, if it cannot be done
the first. If the young trees are properly pruned the first year, they will need
very little pruning the second year, except to cut back last year's growth once-
half and thin out a few superfluous branches. The third year, again cut back
from one-third to one-half. After that, and presuming that the trees have
now their frame work properly made, little or no harm would come if no pruning
were done till the trees are five or six years old. It is better, however, to do a
little pruning each year, and even a little cutting back of limbs that show a very
vigorous growth.

FERTILIZER FOR APPLE ORCHARD.

Having reared apple trees to the bearing age, do not forget to feed them. A good crop of apples will take from the soil about the same amount of plant food that is taken by a grain crop, and should receive the same amount of fertilizer. There is no better fertilizer than ordinary barnyard manure, but where this cannot be procured in sufficient quantities, it may be supplemented with artificial fertilizers, and only phosphates and potash salts should be used. If ashes are obtainable, a small quantity will furnish all the potash that is needed. In good clay soils, commercial fertilizers may not be so necessary as in the lighter soils, but, if cover crops have been used, it is not at all likely that nitrogen fertilizers will be needed to any great extent in either.

TO PROTECT FRUIT TREES.

It is almost impossible to prevent rabbits from injuring fruit trees as they work on top of the snow, but sometimes where there is little snow, if the trunk is protected there may be no injury. As mice and rabbits may be expected in greater or less numbers every winter, young trees should be regularly protected against their ravages. Mice usually begin working on the ground under the snow, and when they come to a tree they will begin to gnaw it if it is not protected. A small mound of soil from eight to twelve inches in height raised about the base of the tree has been quite effectual, but the cheapest and surest practice is to wrap the tree with ordinary building paper, the price of which is merely nominal. Tar paper is also effectual, but trees have been injured by using it, and it is well to guard against this when building paper will do as well. After the paper is wrapped around the tree and tied, a little earth should be put about the lower end to prevent the mice from beginning to work there, as if they get a start the paper will not stand in their way.

BOLTING A SPLIT TREE.

A young tree so overweighted with fruit that a split has started where the limbs branch out can usually be saved by bolting it well.

First, take the diameter of the tree; then procure an iron bolt, three-eighths to one-half inch in diameter and long enough to permit of a nut being put on when the trunk is drawn together. A hole for the bolt is now bored with brace and bit, the bolt hammered through and the nut screwed on, tightening it so that the two parts of the trunk will be as close as possible. The bolt should be well milled to permit of tightening well. It will not matter if the bolt is a little longer than necessary. When tightened, a little wax should be put over the hole at each end to keep out rain until the wound is healed over, although if the bolting is well done it should fit very snug and the wound will soon heal over. One or two strong wires should be run through the top of the tree, attaching them to the branches by means of thumb-screws screwed into the branches, or, better still, with bolts having a loop at one end. Otherwise the tree is liable to twist in a storm. In addition to this, the tree should be well headed back to lessen the top and so relieve the strain on the split part.

BRIDGE-GRAFTING GIRDLED TREES.

Where trees are entirely girdled through the cambium layer to the wood, a method of grafting known as bridge-grafting is often successfully used. First trim the broken edges of the bark back to the sound part. Then cut twigs, preferably of last season's growth, and of the required length to span the girdle.

These should be cut wedge shape at either end. A slit should be made
sound bark, both above and below the girdle, into which the ends of the
can be slipped. These grafts should be about an inch apart around the
portion. If the incisions have been properly made and the twigs cut th
length, they will be firm enough without tying. The application of g
wax at the points where the scions enter the tree and over all wounded
will complete the operation. If the work has been well done the cambi
the twigs will unite with that of the tree and re-establish the flow of sap.
tually the wounds where the scions have been set into the trunk will e
heal and the tree will be sound and in first-class condition.

METHOD OF INSERTING SERVICE

GIRDLED TREE WITH GRAFTS

KEEPING APPLES.

It has been pretty positively settled that the best temperature for keepi
apples is 32 degrees. Since it is impossible always to keep the fruit at exact
that temperature, the efforts of the apple man are spent in seeing how near
can approach that figure. It is allowable to take some margin below the
degrees mark; first, because apples will stand considerable chilling witho
damage, and second, because any storage room must remain at 30 degrees
long while before the fruit gets down below freezing.

Especially when quantities of barreled fruit are first put into storage shoul
the room temperature be run comparatively low; for it takes several days t
allow the apples in the middle of the barrels to get cool enough to keep well
Of course, after a block of fruit has once reached the low temperature required
it will hold it for a long time, if the room is kept at 32 degrees. The old plan
of carrying apples at 40 degrees, or even 45 degrees, has been entirely abandoned.

Recent experiments have shown that apples at 50 degrees decayed two and
a half times as fast as apples at 32 degrees, while fruit held at 68 degrees decayed
more than four times as fast; or, to put it another way, apples will keep four
times as long if stored at a temperature of 32 degrees as they would if stored
at 68 degrees.

PRUNING CURRANT BUSHES.

The best time to prune all of these fruits is in the autumn, although early spring is quite satisfactory. Pruning the raspberry is done by removing the canes which have fruited and the weaker of the new canes, leaving those which remain about six inches apart. The pruning of red currants differs somewhat from that for the black, as the red and white currants fruit on spurs from wood more than one year old, while the black currant fruits on the wood of the previous season. As the fruit on the very old wood of the red and white currants is not so good as on younger wood, it is desirable to remove each year all the wood more than three years old, leaving a liberal supply of two and three-year old wood well distributed about the bush and a few of the strongest new shoots for future bearing wood. Six main bearing branches with their spurs or laterals make a good bush. In pruning the black currants, the main object is to encourage a strong growth of new wood, as it is on this that the fruit will be borne the next year; hence, each year sufficient of the oldest wood should be removed to make a fairly open bush, leaving some strong shoots from the base which will take the place of the older ones the next year. Blackberry canes should be thinned out, as described for raspberries. In the spring the bushes should be headed back to three or four feet and the laterals to about two feet.

CURRANT CUTTINGS.

The best time to take currant cuttings is in the autumn, as currants begin to grow very early in the spring, and once the buds have swollen they cannot be rooted successfully. Wood of this season's growth is used. This may be cut early in the autumn as soon as the wood is ripened. They should be cut in as long pieces as possible to save time in the field, and put in a cool moist cellar or buried in sand. If the cuttings can be made at once it is better to do so. These are made by cutting the wood into pieces each about eight to ten inches long. The base of the cutting should be made with a square cut just below the last bud. There should be at least half an inch of wood left above the top bud of each cutting, as there should be a strong growth from the upper bud, and if the wood is cut too close it is liable to be weakened. Good results are obtained with the least trouble by planting the cuttings in nursery rows as soon as they are made. The soil should be well prepared and should be selected where water will not lie. Furrows are opened three feet apart and deep enough so that the top bud, or at most two buds, will be above ground. The cuttings are placed about six inches apart on the smooth side of the furrows, and soil thrown in and tramped well about them. This soil should be raked off in spring. By autumn they should be large enough to transplant to the field.

THE RASPBERRY PATCH.

The hardiness of the raspberry is its best recommendation. True, there are tender varieties, but the more hardy kinds will continue from year to year with no loss from winter killing. They grow so thickly that weeds give little trouble after the first season.

A cool loamy soil, capable of holding much moisture, is preferred. If not naturally rich, the soil can be much improved by the application of stable manure. Clay soil may be brought into condition by first growing a root crop on it or by turning under a crop of green clover. When only a single row can be planted, it will be most convenient to have it along the side of the garden so as not to

interfere with the vegetables that are planted in the centre. A close
fence prevents free circulation of the air, thus preventing best growth.
to have a wire or picket fence. In field culture the rows are six feet apa
the plants three feet apart in the row. Two plants may be set together to
having any blanks in the row.

Frequent shallow cultivation is required the first season to keep down
and to preserve the moisture of the soil. The worst enemy of the raspb
and of the strawberry too, is a spell of hot dry weather as the fruit is co
to maturity. The crop may be cut in half by such weather conditions. Fai
use of the hoe and rake or the application of water from a hose are the s
preventives.

A good yield may be obtained the year after planting, and a raspberry p
will continue to bear fruit for five or six years with a thinning out of the
canes. It is possible to get a few berries the first year by moving the pl
early, taking as many roots as can be handled and cutting away half or
thirds of the top. Given a start in good soil, a small crop will be secured in
way.

Even with rows six feet apart it will be found that most varieties of
raspberries throw up suckers enough to fill the space between. These must
cut off during the season to maintain a clear space of two feet. Satisfact
results are obtained by some growers by mulching with straw or coarse manu
thus doing away with the need for much cultivating.

Pinching back the canes is a general practice among growers. The you
shoots that have been selected for fruiting the following year are finished
when about eighteen inches high. This will cause them to send out side branch
The following spring the tips of the side branches may be cut off. If this pinchi
back is not done during the early summer, the canes are shortened back in t
fall.

There are several insect pests that attack the raspberry, though none
them are very serious. Cane borers work in the growing shoots and cause th
upper part to wilt and drop off. The effect is similar to that from pinchin
back, so that the damage is not great.

The red varieties are the most widely grown for the reason that they ar
productive and hardier than the black varieties. Herbert is of Canadian origi
and has proven to be one of the heaviest bearers and exceptionally hardy. Cuth
bert, an older sort that has held a leading place for years, is only moderately
hardy. Golden Queen, a yellow berry, and Columbian, a purple, are both suitable
for the home garden.

THE CULTURE OF STRAWBERRIES.

The methods of growing strawberries may be divided somewhat sharply
into two general systems, that for the amateur and that for the professional or
commercial grower. If desired for home use exclusively, it is well to take some
special pains in the selection of varieties and in the care of the plants. Choose
rich soil. The strawberry can hardly be overfed. Plant in spring, setting
plants eighteen inches apart and four feet apart between the rows. Give as
good cultivation as is necessary to maintain a dust mulch throughout the season.
Do not let the runners grow until the plants are well established. Do not let
the plants fruit the first season. When the runners begin to set, train them
into the line of the row and take some pains to distribute them so that the ground
will be evenly covered. Do not allow the row to exceed twelve inches in width.

In the fall cover the plants completely with straw. Do this after the ground is frozen. In the spring rake the straw into the spaces between the rows. It will help to keep the berries clean during picking season. The amateur can continue a plantation of this kind for another year, while the commercial grower usually finds it more economical to plough it under and replant. In other words, he plants every year. The expense of keeping the plantation clean the second year is much greater than the first. Where large berries are desired more intensive cultivation is given and the runners are more rigidly cut off and a system more nearly approaching the hill system is practised. In other words, a comparatively small crop of berries means a crop of large fruit as a rule, whereas a large number of plants usually means a large crop of medium-sized berries.

CRANBERRY CULTURE.

Cranberries grow in soil varying from sandy to rich muck. They do not do well in clay soils, in springy ground or on peat land. Swamps often make good cranberry bogs when cleaned up and thoroughly drained. There should be sufficient drainage to lower the water about twelve inches below the surface. This is accomplished by running an open ditch around the outside of the proposed bog, and if necessary having cross ditches as well. As the cranberry crop may be ruined by spring frosts destroying the flowers, and by autumn frosts injuring the fruit, it is desirable, though not absolutely necessary, to have the bog near a stream which may be dammed, or near water which may be pumped, in order that the vines may be covered with water when frost threatens.

In order to grow the best crops of cranberries there should be no other plants growing in the bog but cranberries. Care should be taken to prevent the growth of weeds, and the usual practice with the best growers is to spread over the soil after levelling, from three to four inches of coarse sand, which will prevent weeds from germinating, and also prevent the plants from heaving the first winter after planting. Planting is usually done in the spring. It is most profitable to get plants of large fruiting and productive varieties in beginning a plantation, as the fruit of cranberries varies considerably in size, and some kinds are more productive than others. The cranberry makes roots along the branches which rest on the ground, and these rooted branches are cut in pieces and used as plants. They are set very quickly about eighteen inches apart each way with a trowel or dibble. They grow readily and little difficulty is experienced in getting a plantation started. The soil between the plants is kept hoed during the growing season to keep down weeds and encourage a rapid growth of the plants. By the third year, at which time the vines come into full bearing, the bog should be covered with the plants. After the plants come into bearing an annual application of from half an inch to an inch of coarse sand is necessary to keep the bog in the best condition.

GROWING POTATOES.

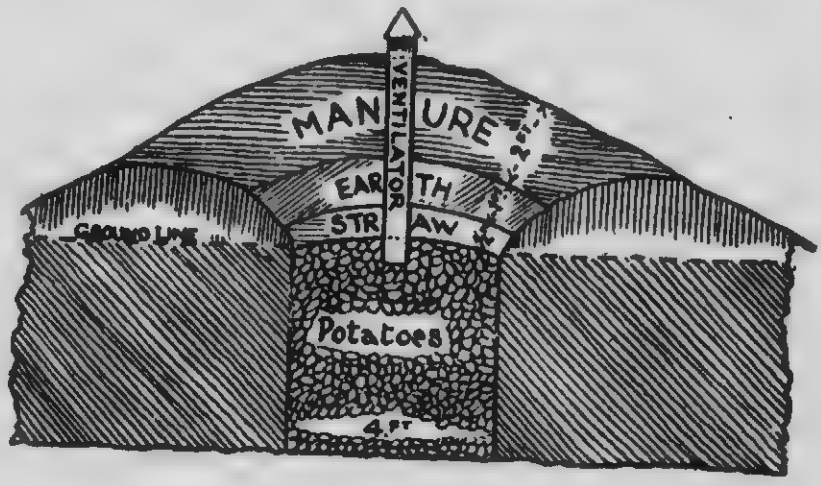
The depth of planting for potatoes differs with many growers. The roots of a young potato plant grow not directly from the seed piece, but from the underground joints or nodes of the stem. From these underground nodes also grow the short stems which bear the tubers at their extremities; hence the seed pieces should be placed deep enough in the soil to permit several of these joints to form below the surface, so as to afford room for an ample supply of roots and tuber-bearing stems to grow. The results, with some exceptions, favor

planting not less than four or five inches deep. Very deep planting is open to objection because of the increased labor of harvesting. In planting, the rows should be laid off as close together as practicable without interfering with horse cultivation, usually from thirty-two to thirty-four inches apart and the hills from eleven to thirteen inches apart in the rows.

Where the potatoes are grown for the early market, the aim is to plant as early as possible, without subjecting the young plants to severe cold. The main crop should be planted at such a date as to bring the stage of the growth during which the tubers are rapidly developing at a time when there is ordinarily an adequate supply of moisture.

Cultivation should commence just as the young plants begin to appear above ground. The field should be gone over with a light harrow, or, better still, with a weeder. As soon as the rows can be followed, the cultivator should be used. If the ground has become packed, the first cultivation may be deep and close to the plants. Subsequent cultivation should be frequent. The conservation of moisture by frequent tillage cannot be too strongly enforced. Tillage should be continued as late in the season as the growth of the vines will permit. As the tops spread out and begin to cover the space between the rows, they partially shade the soil, and thus lessen the loss of moisture by evaporation. The cultivator should be narrowed, and the open space kept covered with loose earth mulch.

Experience and exact experiments generally favor level or nearly level cultivation; excessive hilling during cultivation intensifies the injurious effects of dry weather. It also results in breaking many of the small feeding roots between the rows. The implement best adapted to this work is one having many small teeth, so that it will leave the soil comparatively level.



STORING POTATOES.

Keep potatoes, especially those that are intended for seed, in a cave or pit made for the purpose, so arranged that the temperature may be kept as near the freezing point as possible without the potatoes freezing. Put the potatoes on the earth floor and in the dark. Make the cave of any size or shape; even a pit in the ground covered with poles, a few corn-stalks, a little straw, and six or eight inches of dirt will be suitable. A ventilator four feet long and seven

by seven inches inside measure should extend through the roof nearer the centre, projecting eighteen inches below the roof. If it is made of four inch boards eight inches wide by four feet long, nailed together so as to form a square hollow tube or box, without ends. A square plunger should be made of inch boards, the same length as the ventilator, using four inch boards six inches wide by four feet long. Nail a board that fits over the bottom of the plunger and a larger one over the top, so that when the plunger is placed in the ventilator the board on top will prevent its slipping through into the cave. The plunger should be filled with sawdust and wrapped with a piece of old quilt or padding of some sort, so that when it is in the ventilator the hole will be completely stopped and be frost-proof. Put a screw in the bottom of the plunger and on it hang a reliable thermometer, so that at any time by drawing out the plunger the temperature can be read without having to open it up.

After the earth is frozen hard, throw snow all over and around the cave and cover it up with straw or old hay. The snow will keep the cave warm in winter and cool late into the spring. By the thermometer on the ventilator plunger, you can keep tab of the temperature, and if it is too warm, leave the ventilator open cold nights. If it gets below thirty-four degrees, hang a lighted lantern on the ventilator plunger, and this will warm up the cave in a little while.

TOMATO CULTURE.

The chief aim in growing tomatoes for the general market or for home use is to have them early. The profits from early tomatoes are much greater than from the later fruit. This being the case, it is desirable to have the plants well advanced when they are set out in the open. In Southern Ontario seed is sown during the first days of March, while in Eastern Ontario the latter part of March and early in April is the usual time. From nine to ten weeks should be allowed from time of sowing until planting out, the plants not being set out until danger of frost is over. The seeds may be started in a hot-bed or green-house or even in the house, where tomatoes are grown on a small scale. When sown in a hot-bed the seed is sown thinly in rows four to six inches apart. As soon as the rough leaves appear, the young plants are pricked out about three inches apart each way, and as soon as they become crowded they are again transplanted from six to eight inches apart, each way, or planted singly in boxes or pots. The temperature must be so regulated that the plants will maintain a healthy growth, and be as far advanced as possible at the time of setting out. Stocky plants are very desirable for setting out, and to obtain these they should have plenty of light. Tomatoes do best on a warm soil, either good sandy loam or light clay loam. Soil rich in nitrogen induces too much vegetable growth, and while the fruit is earlier on the light, poor soils there is not so much of it. The plants are set out in the field four feet apart during the month of May to the first week of June, the time depending on the chances of frost as the tomato plant is very tender. The soil should be kept thoroughly cultivated during the early part of summer.

ASPARAGUS CULTURE.

One of the best and easiest grown of our garden perennials is the asparagus plant. It can be started either from seed or from plants. If one wishes to raise plants to sell, it is better, of course, to plant the seed; but if asparagus is wanted for home or market use, in the shortest time possible, it is better to set out yearling seedlings.

It is important, in laying out the asparagus plantation, to select a pl where it can remain permanently, for, if taken proper care of, the plantat will last for twenty years. The old idea was the asparagus "bed"; the new to plant in rows the same as corn, etc., so that for the market garden the culti tion can be done by horse. The land selected should be a deep, rich, ferti moist and cool soil, having a warm exposure, a gradual southern slope bei preferred. If the land is originally hard and coarse, it should be worked a ye or two in advance by the raising of some thoroughly tilled crop, using as mu manure as possible in the process. Late, deep fall ploughing is preferabl turning under a thick covering of well-rotted manure. When the frost is o of the ground, plough furrows from six to ten inches deep and four feet apar If the soil it not of the best quality, two or three inches of well-rotted manu should be placed in the bottom of each trench, with a couple of inches of loos soil on this. Then place the plants in the trench three feet apart. Cover wit three inches of earth; it is not well to cover deeper, as it takes too long for th young shoots to push their way through. As the shoots grow, the rest of th earth can be filled in around them by after cultivation. When filled in, th crowns of the plants should be about six inches below the surface of the ground for if planted much less, the roots will push up to the surface and interfere wit cultivation.

As the asparagus is a gross feeder, it is well to mulch in the fall with more or less well-rotted manure, although straw and leaves will do. Before mulch- ing, the old stalks should be cut and carried away, and, if affected with rust, should be burned. In early spring, the straw and undecayed leaves should be removed, and about the last of June a coating of well-rotted manure should be applied and worked in. Very little cutting should be done until two years after setting out, and then the cutting should not be carried on later than July first, as the plants need to grow in order to store up a food supply for the next year's growth. In cutting the asparagus for use, a sharp, square-pointed knife should be used, and a straight, downward cut made just underneath the surface of the ground, care being taken not to injure the unseen shoots.

Where plants are affected with rust, spray with soap Bordeaux mixture, which is made up of four pounds of copper sulphate, four pounds of fresh stone lime to forty gallons of water, adding four pounds of dissolved laundry soap. As a preventive, destroy all stray plants affected with rust in the vicinity.

Salt may be applied to asparagus to such an extent as to kill all the weeds without injuring the plants. On some soils a marked increase in yield is obtained by such an application, though in other cases no benefit is noted.

EVAPORATION OF FRUIT.

Fruit growing is, to a large extent, a manufacturing business. In most lines of business the prevention of waste or the saving of waste materials and by-products are extremely important, and may, indeed, mean all the differ- ence between profit and loss. It is obvious that in fruit growing and marketing there is, and always must be, considerable loss. The principal ways of using waste or culled fruits are: drying, canning, preserving, jelly making, and the manufacture of cider, vinegar, etc.

One of the best uses to which cull fruit can be put is to evaporate it. All sorts of fruit can be evaporated; so can many vegetables. Different kinds of produce require different treatment, according to the texture and

the amount of water they contain. There is a wide difference even in different varieties of apples. The following table will be of some use for comparison, but much depends upon the kind of evaporator used, particularly as to the time it will take to dry the apples.

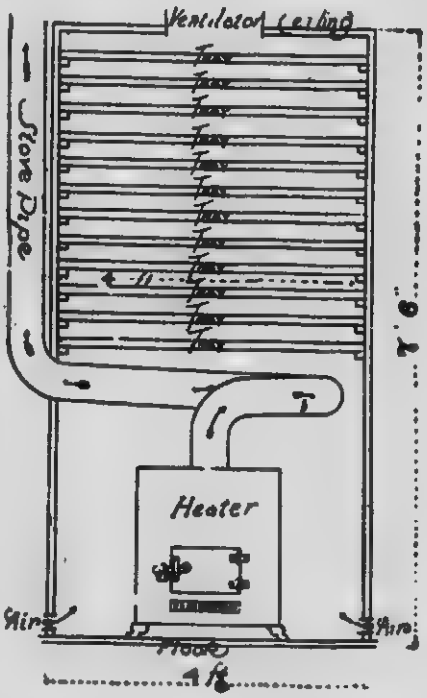
Variety	Pounds to the bushel.	Hours required to evaporate.
Roxbury Russet	9	1½ to 2
Greening	6	2 to 2½
Baldwin	6½	2¼ to 2¾
King	5½	2¾ to 3¼

From this it will be seen that apples should be sorted so that the softest or juiciest may be dried by themselves and the harder varieties dried by themselves.

Very simple evaporators can be bought or even made for home use. Usually they are adapted to utilise the heat of the kitchen stove or range. The oldfashioned racks that used to be hung over the stove had many objectionable features, and the process was very slow. A closed in tin or iron frame with perforated or wiretrays is cleaner, more sanitary and more expeditious.

A stove drier can be made to cure from two to four bushels in a day; but, to carry on the business on a large scale, the evaporator should be provided with its own heating and regulated with a view to both efficiency and economy.

In placing fruit on the trays it must be distributed so as not to obstruct the hot air current. If on a stove, the plates or lids must be left on, as no flame or smoke or gas should enter the evaporator.



A SMALL EVAPORATOR.

Put fresh fruit trays nearest the stove and move them up as they dry, replacing with others by rotation until process is completed. When partially dried two trays may be emptied into one, to advantage. Cleanliness is, of course, to be rigidly observed throughout. Regulate so as to avoid scorching. If sulphur is to be used to prevent oxidation and give apples, pears or peaches a good color, simply drop a piece of brimstone the size of a bean on the stove, close to or under the drier. It will ignite and the fumes will be drawn up into the drier. Otherwise this can be done out of doors or in another room. Keep the evaporator covered to exclude flies, etc., when not in use.

Another popular method of utilizing waste fruit is to can it. For home use, however, the best is usually selected for "doing down" and canning factories look after the bulk of the inferior portion of the crop.

EARLY AND LATE CABBAGE.

The needs of the whole cabbage family—including as well cauliflower, kale, Brussels sprouts and broccoli—are so nearly alike that when conditions are made right for one it is possible to grow them all. An old garden plot is not the best place, because the soil is likely to be infested with the germs of club root. It is on the farm that cabbage can be produced most easily by top dressing a piece of sod—preferably clover—plowing early in the spring and harrowing several times. For late cabbage, which has a longer growing season, the heavier and cooler soils are desirable. In the cooler soil the late cabbage will not suffer so much in the hottest part of the summer, and these heavy soils will not require as heavy applications of manure as for the early crop, though a good dressing is desirable.

To get the plants started early, it is necessary to have a greenhouse or hot-bed. When the object is to get early cabbage, the seed may be sown the first week in March, to have plants ready for setting out in April. There is risk from frost in making such an early start, but with plants well hardened off, a temperature several degrees below freezing may be endured after setting out. If a hot-bed or greenhouse is not available, the seeds may be sown thinly in pots or boxes in the house, and the young plants kept in the light at a temperature of about fifty degrees until it is warm enough to put them outside, and before doing so they should be well hardened by putting them in the light in a still cooler place.

The time for transplanting early cabbage will depend on the chances of severe frost. At Ottawa, near the 'd of April or early in May is the usual time. A dull day or a day without high drying winds should be chosen, if possible, as in transplanting success in having extra early cabbage depends on having no setbacks, such as wilting or loss of the first planting. Before transplanting the soil in the frames or in the flats should be thoroughly soaked so that when the plants are dug out the soil will adhere to them, especially when pressed with the hand. The plant should be set deep enough so that the first leaves are almost touching the ground, and, after covering, it is very important to press the soil well about the plants so that the roots will come in close contact with the moist soil. Early cabbage are planted about 18 inches by 30 inches apart, and late cabbage about 30 inches each way. Cabbage are planted during the latter part of June or early in July.

Thorough cultivation conserves moisture, permits the air to penetrate readily into the soil, and thus assists in making the plant food available. As soon then as the plants have recovered from the slight wilting which there is likely to be, the ground should be cultivated shallow and hoed, and hoeing and cultivation should be constant until the plants meet or until there is danger of breaking the leaves

CAULIFLOWER.

The cauliflower is a much more difficult plant to grow than the cabbage. From the sowing of the seed to the marketing of the head constant care is necessary It will not stand as much cold when planted in the field as cabbage, hence if set out early must be better protected and must be well hardened off. When transplanted to the field, the root maggot will select it in preference to early cabbage alongside, and will often ruin a plantation of cauliflower when the cabbage will be left untouched. Dry, hot weather is very hard on cauliflower, and often if they head at all the head is small and hard. The cauliflower succeeds best in the cooler and moister parts of Canada. In some places it is found that

it is not profitable to plant cauliflower early in the season, as they will then head in the hottest and driest part of the summer, and there is much trouble with the root maggot also.

The preparation of the soil, time of sowing the seed, and method of transplanting and cultivation are almost the same for cauliflower as for cabbage, and a constant supply of moisture is even more important.

Greater care must be taken of cauliflower in the hotbed than of early cabbage, as the young plants damp off more easily. The beds should be kept well ventilated. The plants should be watered as little as possible and having the surface of the soil wet should be avoided, when the beds are not or cannot be well ventilated. The plants transplant best when they are quite small before the first rough leaf appears. They must not become stunted or poor results will follow. In order to protect the heads from the sun and keep them white, the leaves are drawn together over the head and tied as soon as the heads begin to be exposed. Before tying it is desirable to kill the cabbage worms with pyrethrum powder, if there are any. The head and leaves should also be dry when the latter are tied.

The early varieties are used both for the early and late crops. Early Dwarf Erfurt and Early Snowball are the two best known sorts.

ONION CULTURE.

In growing onions successfully when the season is short, early sowing is one of the most important considerations. The land should be prepared just as soon as it is dry enough to work in the spring and the seed sown at once, as onions require a long season and should be mature before the cool weather of early autumn.

It is important to have the land as clean as possible to save labor in destroying weeds. Onions require a large amount of available plant food in the soil, and it should, therefore, be made very rich beforehand by the application of barnyard manure or chemical fertilizers. If it cannot be applied in the autumn, well-rotted manure may be worked into the surface soil early in the spring, but the manure should be thoroughly incorporated with the soil or the latter may dry out, and it would be difficult also to sow the seed properly. The surface soil should be thoroughly pulverized and made as fine and level as possible before sowing the seed. Onions are sown much more satisfactorily with a seed drill than by hand, as the seed is sown more evenly, and the soil, being pressed down by the roller of the machine, is left in better condition for the germination of the seed. To insure having good seed, it should be tested before being sown. The seed should be sown about half an inch deep in rows from twelve to fourteen inches apart, from four to six pounds of seed per acre being required. As soon as the plants have grown sufficiently for the rows to be seen, cultivation should begin and the surface of the soil kept loose. As soon as the plants are large enough to work with easily, which will be when they are from three to four inches high, they should be thinned to from one to two inches apart, but it is best to leave them a little on the thick side. After thinning, the soil should be at once cultivated and the surface henceforth kept loose during the growing season to destroy weeds and promote the rapid development of the onions. If growth continues late in the season, ripening may be hastened by bending over the tops, thus checking the flow of sap, an empty barrel being often used for this purpose. As soon as the onions are ripe, they should be pulled and left in rows, and turned occasionally until they are dry enough and firm. As soon as they are dry, they should be stored in a cool, well-ventilated place where they will

not be exposed to frost. Two of the best varieties of onions are Large R Wethersfield and Yellow Globe Danvers.

RHUBARD CULTURE.

Rhubarb may be planted early in spring or preferably early in autum The old plants should be very carefully taken up so as to break as few roots possible, and then divided into plants, each having at least one strong bud a some roots.

Rhubard does best in rich, warm, well drained soil. A good applicatio of barnyard manure ploughed in is desirable, but if applied in the spring it shoul be rotted so that the ground will not be made too open, causing it to dry out to easily. The fertility is kept up by a good top dressing of manure applied eac summer after the last cutting of stalks. The plants should be set four by fou feet apart when the ground is wet. Crowding will result in smaller stalks later on Plant about two inches deeper than they were before and give good cultivatio during the first season. During the second spring or summer the leaves may be used freely. Barrels or boxes placed over the crowns in spring will haste the growth. Victoria and Strawberry are the varieties most suitable for hom use.

GROWING CELERY.

Much will depend on the soil in deciding whether to grow celery in trenches or by level culture. If the soil is very heavy, or, on the other hand, sandy, it would be a difficult matter to earth up plants grown level, and it would be better to use the trench method; but with good loam soil one can earth up to good advantage. The trench method is also desirable on dry, leachy soil, while the opposite is true on wet, retentive soil. On damp, peaty soil, use a fertilizer rich in potash, but use it sparingly, as celery grows quickly, is composed largely of water, and gets its stimulant from the nitrogen that is always present in such soil to an abundant degree. If a commercial fertiliser is needed, use muriate of potash at the rate of three hundred pounds per acre, either just before setting the plants, harrowing it in, or before the first cultivation. From the first to the fifteenth of August is as late as is wise to set out celery plants.

BLANCHING CELERY.

It is important to keep the celery growing throughout the summer by giving good cultivation. If the celery is checked in its growth, it is liable to become hollow or pithy. When the celery has grown tall enough to make good stalks it is time for blanching. The very large growers of celery use comparatively little hand labor in preparing the plants for blanching, merely moulding up the soil about the plants with a plough especially made for the purpose. Those most anxious to have the best celery, however, go over each plant by hand, breaking off suckers and weak outside stalks, then drawing the stalks of the plant together and holding them in position by packing soil about the plant. This may be begun when the plants are about six inches high. This work is done very rapidly The rest of the work is now done with the spade or plough, or both, piling up the soil well about the plant, merely leaving the top leaves and especially the crown or central part of the plant exposed. This moulding up should not be done when the soil is very wet, as it would be likely to stick to and discolor the plants.

Early celery is now very generally blanched by means of boards, which while not giving celery of quite as good quality as is blanched by soil, give very satisfactory results. Boards one inch thick and twelve to fourteen inches in width are most suitable. They are placed on each side of the row and brought up as close to the plant as possible, and are held in place either by stakes or strips nailed or hooked across the boards. A little soil is thrown up along the base of the board to prevent the light getting in that way. Early celery will blanch in from two to three weeks when boards are used. For home use celery may be blanched with good results by using four inch tiles, which are placed over the plants. Celery blanched in this way is clean and of good quality.

Celery for late use is not blanched in the field except where the climate is mild enough to leave it outside until used It is, however, often gone over once to remove the suckers and weak outside stalks and banked up a little to hold the plants upright.

GROWING LETTUCE.

For spring planting of lettuce it is usual to start in greenhouses or hot-beds Lettuce may be transplanted to the open ground as soon as the soil will work, but the plants should be well hardened off before being removed from the hotbed. In the open ground, lettuce plants should be set out about twelve inches apart each way. It is frequently grown between rows of cabbage, cauliflower or other plants where it fills up otherwise unoccupied space and comes off the land long before other crops need the room it occupies. For late use, the seed is often sown in the open ground in drills one foot apart and the plants thinned to the same distance apart. It is customary also in the home garden to sow the seed and then cut off the young plants as soon as they are large enough to use; such lettuce, however, is not nearly so good as head lettuce where the center is white, crisp and tender. It is a far better plan to thin out the young plants so that they stand three or four inches apart in the rows, and in cutting continue the thinning process so that the later plants will form good heads. Of course, it is necessary to make successive sowings of lettuce in order to have it fit for table use over a long season. Like all leaf crops, lettuce needs plenty of rich, easily available nitrogenous manure and responds very quickly to small applications of nitrate of soda.

HOT BEDS AND COLD FRAMES.

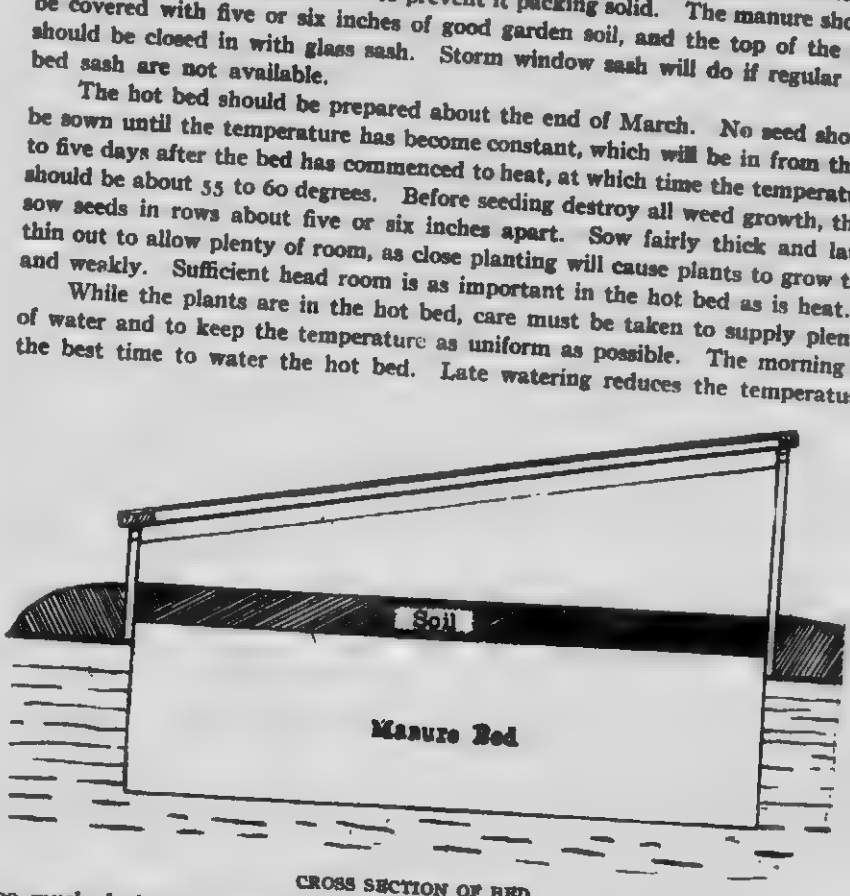
A most valuable arrangement in the preparation of any garden is a small hot bed, called such because it makes use of artificial heat. The cold frame is very similar, but only utilizes the sun's rays for heat. The hot bed is principally used in the production of early vegetable plants, which may be transplanted to a cold frame or directly into the outdoor gardens later in the spring. The season can thus be advanced anywhere from two weeks to two months over crops sown directly in the ground. Tomatoes, cabbages, cauliflowers, beets, carrots, celery, lettuce, etc., can thus be planted in the hot bed in order to get an early start. Hot beds can often be utilized for starting flowering plants as well, which can be transplanted outdoors if the danger of frost is over.

The form of hot bed usually employed consists of an enclosure covered with sash and heated by fermenting stable manure. A very serviceable hot bed can be made by constructing a box five feet wide, three feet high in front, four feet high at the back and of any length desired. This should be placed in a well-

sheltered location, with the lower side to the south, and then filled to a de
of about two feet with well-compacted horse manure containing a suffici
quantity of straw or other litter to prevent it packing solid. The manure sho
be covered with five or six inches of good garden soil, and the top of the
should be closed in with glass sash. Storm window sash will do if regular
bed sash are not available.

The hot bed should be prepared about the end of March. No seed shou
be sown until the temperature has become constant, which will be in from thr
to five days after the bed has commenced to heat, at which time the temperatu
should be about 55 to 60 degrees. Before seeding destroy all weed growth, th
sow seeds in rows about five or six inches apart. Sow fairly thick and lat
thin out to allow plenty of room, as close planting will cause plants to grow t
and weakly. Sufficient head room is as important in the hot bed as is heat.

While the plants are in the hot bed, care must be taken to supply plent
of water and to keep the temperature as uniform as possible. The morning
the best time to water the hot bed. Late watering reduces the temperatu



CROSS SECTION OF BED

too much during the night. By watering in the morning the plants and soil get a chance to dry off and warm up during the heat of the day. Soft water slightly warmed should always be used. On bright days the bed is likely to become too hot owing to the action of the sun on the glass, and it will be necessary to ventilate by slightly raising the sash on the side away from the wind. If moisture collects on the under side of the sash, ventilation is required. During cold nights it may be necessary to cover the sash with blankets, sacks or other coverings to prevent the temperature falling too low. For tomatoes the temperature should range from 75 to 85 degrees during the day and may go down to 60 degrees at night. Cabbage, cauliflower and celery require a temperature of 65 to 75 degrees during the day and may go as low as 40 at night without harming the plants. When plants are from three to four weeks old additional ventilation should be given during the day to harden them.

To get the best results, plants should be transplanted from the hot bed to a cold frame and left there for some time before being finally planted out in the garden. The cold frame is constructed in exactly the same way as the hot bed, except that no manure is provided for heating. This treatment makes the plants vigorous and stocky and better able to withstand the outside conditions.

While in the cold frame the plants require very little water. The final transplanting can usually be done with safety about June 1. The plants should be set out in the evening or on a cloudy day, given plenty of water and provided with some shelter such as cans or shingles to protect the plants against wind and sun until the roots have become firmly established.

PROTECTION FROM FROST.

Danger from frost is not the same in all locations, for even a limited experience will show that a cold night that destroys plants in one man's garden will leave another's untouched although only a short distance away. A lake or even a flowing stream will modify the temperature of the air in the vicinity, particularly on the side toward which the wind is blowing. A fairly high wind will do much to prevent injury by frost, and for this reason a garden plot on exposed ground may escape when severe damage is done on lower ground. Fruit growers speak about air drainage, a term which applies to the site of an orchard. Apple trees standing in a hollow are in the worst situation for frost since the cold air from the surrounding hills falls to the lowest level, and it is here that freezing first occurs.

As to the means of protecting plants, the simplest is a paper cap, a berry box or a basket turned over the plant. A few tomato plants can easily be covered in this way and saved from the frost. The box should be placed early in the evening and need not fit very closely to the ground, as it is often better to have a little circulation of air around the plant. The plan of protecting against frost by smudges is hardly practicable for the small gardener, for it means staying on guard a portion of the night. Fruit growers who have valuable crops to protect have adopted the method and find it gives good results. If there is a pile of rubbish in the garden it may be well to keep it for a cold night. Add some material that will burn slowly, and start it going about nine o'clock.

Spraying with cold water both at night before the frost and early in the morning while the frost is yet on the plants is also a good precaution. It will lessen the damage from frost, but it must be applied liberally and before the sun has reached the plants.

By way of precaution, have all plants such as tomato and cucumbers hardened off before they are set in the open ground A plant taken direct from a conservatory when the temperature has been from sixty to eighty degrees will be severely checked and probably killed by a day or two of cold weather even if temperature does not reach the freezing point.

GERMINATING TABLE OF GARDEN SEEDS.

	Days		Days
Bean	5–10	Lettuce	6–8
Beet	7–10	Onion	7–10
Cabbage	5–10	Pea	6–10
Carrot	12–18	Parsnip	10–20
Cauliflower	5–10	Pepper	9–14
Celery	10–20	Radish	3–6
Corn	5–8	Salsify	7–12
Cucumber	6–10	Tomato	6–12
Endive	5–10	Turnip	4–6

RENOVATING AN OLD LAWN.

When grass becomes thin in a lawn it is usually due to poor soil, ab white grubs, or winter killing. If due to shade, nothing much can be don improve it without removing what shades it. If it is thin through winter ki or poor soil, it should be thoroughly raked over as deeply as possible to rem dead plants and to loosen the soil between those alive. This should be don the ground can be worked. Seed of Kentucky blue grass should now be s thickly, say at the rate of about one ounce every 50 square feet, broad-cas over the lawn, and the lawn again raked to help cover the grass seed. If is done early, while the surface soil is still moist, the grass seed will soon germ ate, and if the weeds which will come up are mowed off several times, by summ there should be a good stand of new grass. Three or four top dressings of nitr of soda should be made throughout the season beginning in the spring at abo the rate of 75 lbs. per acre each dressing. This should stimulate growth. Ju before winter sets in the lawn should be mulched with manure, which will a enrich the soil.

POTTING HOUSE PLANTS.

In the potting of house plants you can mix the proper soil yourself if yo know the needs of the different plants. Take some old blue-grass sod and pi it up until it rots, and you will have the ideal form of decayed vegetable matt for the principal constituent of all kinds of soil for potted plants. There ar three kinds of potting soil, as follows:

For geraniums and the ordinary varieties of blooming plants—three part loam from the rotted sod, one part well-rotted manure and one-half part sand if the soil is heavy.

For ferns, begonias and such foliage plants—two parts loam, one part pea or leaf mould, and one-half part sand, if soil is heavy.

For palms or roses—two parts clay loam and one part well-rotted manure and sand to suit the texture condition.

Use the finger test to learn when the plants need water; when the soil crum bles easily until dry, it needs water; when it cakes readily, there is too much water. Do not give the plants a little water each day, but only when needed, and use only water that is of the temperature of the room. Never use a nozzle or the end of a hose in watering, as this causes the stream to pack the soil and injure the foliage.

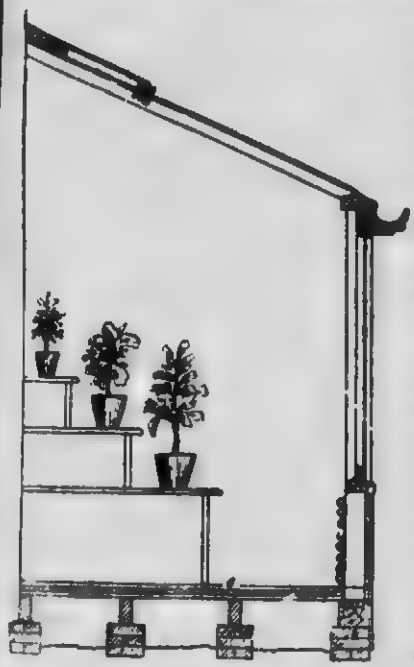
To prevent window plants from blooming only on the street side, turn them occasionally, and you will have the blooms in the room as well. Do not give foliage plants as much light as flowering plants; keep the ferns in a shady corner; a north window is a good place.

PROPAGATING ROSES.

Roses may be propagated either by layering or by cuttings. The former method may only be practised successfully out-of-doors, and the latter either when the plants from which the cuttings are to be taken are in the house or are planted out. In layering, a branch is notched half way through, making a long cut to expose as much of the cambium layer as possible. The slit or notch should be held open by inserting a small stone or sliver of wood, and the branch bent to the ground or pegged down so that the slit portion may be covered by a few inches of soil. If the season is dry when layering is practised, the

soil around the layered portion should be watered or mulched. When the end of the layered portion shows roots, it should be detached from the plant and either planted out where wanted or potted for house culture. Cuttings are made from immature wood of thrifty growing plant. These cuttings may be made of any length, those with two or three eyes being best. Place the cuttings in moist sand or soil and never allow the material to become dry. Set in a sunny exposure, and in from four to six weeks roots should be showing, when they may be potted. Use small pots and change the plants to larger pots as the roots grow until you have the plants in the sized pots you wish them to bloom in. In growing roses in the house it is necessary to spray the foliage often to prevent attacks of red spider.

GREENHOUSE CONSTRUCTION.



SIDE VIEW

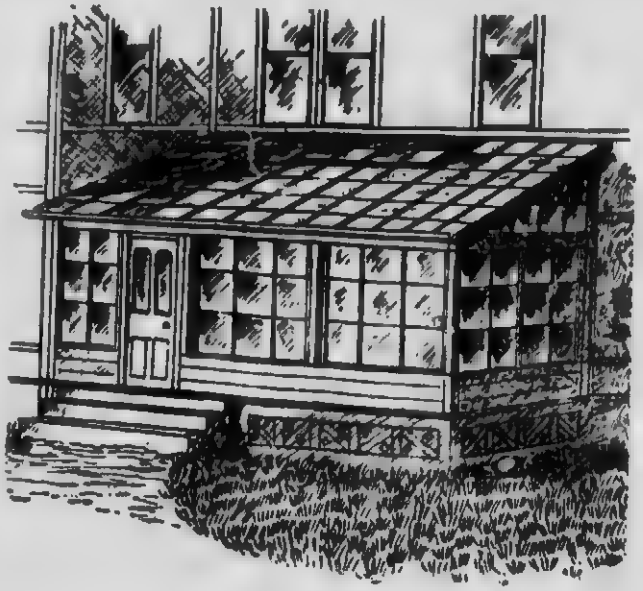
The production of vegetables under glass is rapidly becoming one of the most important branches of agriculture. It is essential to the production of early plants and also to the early marketing of several varieties of table vegetables. In fact, there is a demand for fresh vegetables all the year round, and, as a consequence, the wide-awake farmer and gardener must prepare to take advantage of his opportunities.

In the first place, only persons with practical training and experience can make a greenhouse pay. Secondly, the plant should be situated in a good locality for securing labor, fuel and water; market or other selling facilities should be considered carefully if a commercial business is to be carried on, even on a small scale. In a small way one can grow several crops of lettuce and possibly some cucumbers and tomatoes during the late winter and later use the premises as a starting house for certain field crops for the summer. Provision also might be made for a flower section.

The most important part of this, as of any other structure, is the foundation. This must be strong and perfectly plumb. It should be, preferably, of concrete, eight inches in thickness and sunk below the frost line. The walls may be of concrete, brick, clapboards or other siding. As a rule, walls are not built more than two or three feet high, the remainder being glass. Hollow concrete blocks make a very satisfactory wall. Some soils require drainage around the walls to prevent frost action. These should be 2 inches or 2½ inches tile and set at base of foundation on the outside. Tar-paper should never be used in the walls. It is contended that the lower the eaves the better, though some run the walls up to seven or more feet. A five foot eave would seem to be roomy enough and fill all other requirements, including good ventilation, which is essential.

The superstructure is very simple in design and construction. Any carpenter and many handy farmers can make the frame, which will doubtless be

of wood, with glass set into sash, which can be obtained ready-made and set at any angle desired, so long as it will shed the water readily and not hold too great weight of snow. If built up against a house, as in the accompanying illustration, the structure should face the east or the south. Artificial heat can usually be obtained most economically from the furnace in the house. Plants must have plenty of overhead air space, and it is not essential that they be set near the glass, so long as they have plenty of light and the temperature is right. Iron frames will be more permanent and can be had ready to erect, but they will be quite expensive for some time to come. The size is entirely a matter of choice and convenience for the proprietor.



FRONT VIEW

PLANTING SWEET PEAS.

Sweet peas generally prove most satisfactory when planted as early in the spring as possible. As soon as the ground can be prepared, rake furrows running north and south, or northeast and southwest, and sow thickly in these furrows, covering only one-fourth to one-half inch deep; if covered too deep, the peas will rot. When two or three inches high, hoe the soil in about the stems, and continue this process at intervals as the plants grow, until the furrow is filled and the surface of the soil is level. The roots will then be in the ground deep enough so that the heat of the summer will not be so likely to check the growth and cause the yellowing of the foliage and death of the plant. In shallow planting, where the sun's rays are hot, the heated soil almost invariably destroys the plant before the blooming period is reached. It will not hurt the plants to freeze. It is well to order seeds of a reliable nurseryman and plant early.

DAIRY HUSBANDRY.

THE DAIRY BREEDS

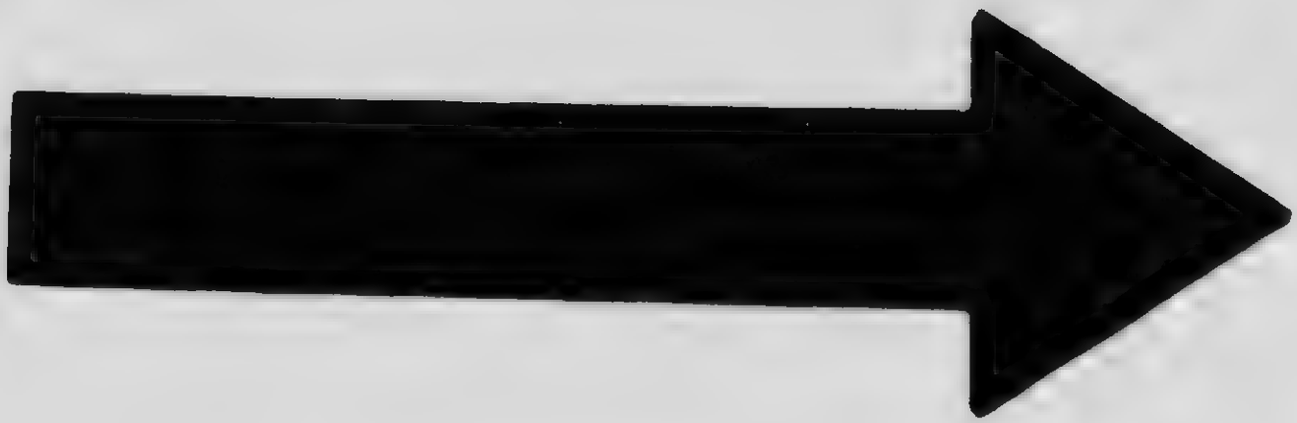
There is no best dairy breed. When making a choice of animals to build up a herd it is well to obtain them of the breed that is most popular in the district. In this way it will be possible to get the services of good sires and thus improve the quality of the stock. There are poor milkers and unprofitable cows in all breeds. Select, if possible, by records of actual performance, keeping the dairy type always in mind. In Canada there are five dairy breeds—Holstein, Ayrshire, Jersey, Guernsey and French Canadian, that are fairly well established. A few herds of Dutch Belted and Brown Swiss are also kept.

Holstein.—This breed has been officially known as the Holstein-Friesian. In Great Britain the name Friesian has been adopted and there is an agitation to make the same change in Canada. Holstein cows average about 1,200 pounds, being the heaviest of the purely dairy breeds. Their color markings are black and white, sharply defined and not blended. It is generally acknowledged that the Holsteins give the greatest yield of milk though the per cent. of fat averages lower than with other breeds. Lack of color in the fat of Holstein milk is responsible for much of the prejudice against it since in the popular mind the yellow tinge is erroneously considered an index of richness. The calves are well adapted for veal production and the milk is better suited for calf rearing than that which is excessively rich. The Holstein cow is adapted to level rich pastures and where liberal feeding is possible.

Ayrshires.—In size the Ayrshire ranks between the Holstein and Jersey, a weight of 1,000 pounds being the average for cows. The common color is spotted red or brown and white in varying proportions. The two colors are distinct and do not blend to form a roan. The horns are rather long and as a rule curve outwards and upwards and in some cases slightly backwards. In form the Ayrshires do not show the extreme angular dairy type as exhibited by high-class Jerseys or Holsteins. They are smoother over the shoulders, back and hips. As a breed the Ayrshires are noted for a good, uniform production of milk rather than for remarkable records. The fat globules are small and the milk and butter do not show much yellow color. The milk is well adapted for cheese making.

Jerseys.—The Jersey is the smallest of the dairy breeds with the exception of the Kerry. In Canada and the United States the larger animals are favored but the cows mostly run below 1,000 pounds. A model Jersey has a pronounced wedge shape and a well-developed udder. The color may be any shade of yellow from almost white to very dark squirrel grey or black. The tongue and switch are generally black. The muzzle is intensely black, encircled by a light-colored ring. As a rule the bulls are darker in color than the cows. Jerseys are easy keepers and do better on rough and scanty pasture than the Holstein but are not equal to the Ayrshire in this respect. The heifers mature young and may be brought to milk at the age of 22 to 24 months.

French-Canadian.—This breed is descended from the native cattle of the provinces of Normandy and Brittany, France, and on this account is closely related to the Jersey and Guernsey. The cows average from 780 to 900 pounds at maturity. In color they are black or black with an orange-colored strip down the back and around the muzzle. They are well adapted to hilly and rough pastures.



MICROCOPY RESOLUTION TEST CHART

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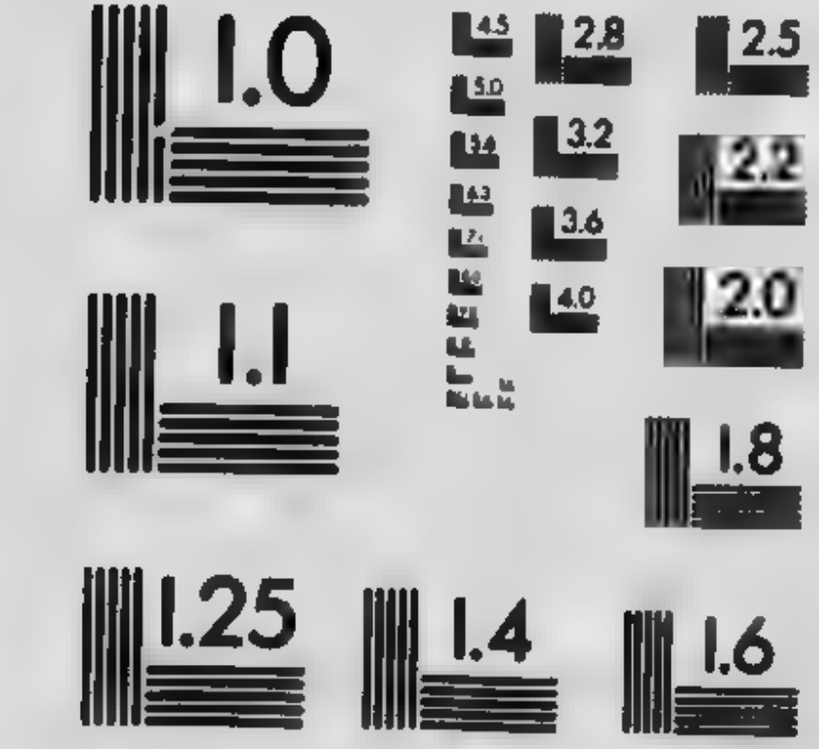

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JUDGING A GOOD MILKER

There is no certain method of telling a good milking cow except by weighing and testing the milk from a cow during one or more years. Tests for shorter periods are important as indicating the probable value of a cow, but a yearly test is the one to be recommended. This means weighing the milk of every milking and taking samples for testing for fat daily, then testing these once a month with the Babcock test. A preservative is put into the sample jar to keep the milk sweet for a month. Some advise weighing and sampling once a week, three times a month, or once or twice during the lactating period (time cow is milking). The oftener the weighing and testing are done the more correct are the results.

Some men are wonderfully expert at judging cows by sight and feel, but the best will get fooled quite frequently. The chief indications of a good milker are generally considered to be the following:

1. The cow should have a good constitution, or in other words, be healthy, as indicated by bright eye, mellow skin, soft hair, plenty of room for heart and lungs, or what is known as "good heart girth," easy, regular breathing and not hollow behind the elbows.

2. Good digestive capacity, as shown by a good large middle piece or bread basket, plenty of space between the last rib and hip bone, large mouth, strong lips, good appetite and a general appearance of thrift.

3. Good-sized udder coming well forward and reaching well up behind. The udder should not be fleshy, but should be quite limp when the cow is milked out. It should be covered with soft skin and fine hair. The udder veins should show prominently through the skin. The so-called milk veins, which carry the venous (used up) blood from the udder to the heart and lungs along the under side of the body, and which enter the body through the so-called milk wells, should be large and tortuous.

A well-developed spine, broad dishing forehead and bright eyes are indications of nervous energy which is supposed to be a sign of a good milker.

In addition to all this, we look for a cow that is more or less pretty, although a person is foolish to sacrifice utility for beauty. "Handsome is as handsome does," is especially true of the dairy cow. The lines of beauty are, fine clean cut head, fine horns, bright eyes, medium length of rather thin neck, fine shoulders, large barrel, broad loin and hips, long rump, fine tail and good switch, short limbs, proper blending of colors so as to give a pleasing appearance, and lastly, a stylish appearance—a feminine quality which is easily recognized, but cannot be described.

But after all, the emphasis should be placed on "perform" and not on "form" of the dairy cow.

RECORD OF PERFORMANCE

In order to encourage the improvement of dairy stock and furnish an official record regarding the amount and quality of milk that can be produced by individual cows under the most favorable conditions, the Dominion Department of Agriculture has for a considerable period issued an annual report of the performance of pure bred dairy cattle.

The rules and regulations governing these tests are very rigid and specific and great care is taken to have the results correct. The principal conditions are as follows:

Only animals that are registered in the Canadian Herd Book, according to their respective breeds, can be entered for the tests.

Every cow under test must drop a calf within fifteen months after the beginning of her testing period in order to qualify for registration of performance.

Application for entry of cows for testing must be mailed within thirty days after calving and it is desired, whenever possible, that such entries should be made before calving.

The owner of every cow entered for test is required to weigh or cause to be weighed by a responsible person, each milking from such cows and to keep posted in a conspicuous place in the stable or milk house, a correct record of all milkings from such cows. This must be entered on forms supplied for the purpose.

Owners are required to report to the Live Stock Commissioner, Ottawa, each month on forms provided, the records of all tests made. These reports should be mailed to the department within ten days of the end of each month.

The Department of Agriculture at Ottawa undertakes the supervision of these tests of cows through the various breed associations, the latter having officially recognized the tests outlined. A report of the performance of each animal tested will be forwarded to the secretary of the Canadian Association representing the breed of such cow, at the conclusion of the testing period.

Government inspectors visit the stables in which registered cows are kept at irregular times and unannounced. They are required to remain at least two days and make certain tests besides personally weighing the milkings given during their visits.

A certain minimum production must be reached by individuals of each breed before they are eligible for competition.

In the Ayrshire breed, the two-year-old cow must produce at least 5,500 lbs. of milk and 198 lbs. of butter fat; and the mature class cow 8,500 lbs. of milk and 306 lbs. butter fat, before entry. Three and four year old records grade between the above figures.

Similarly, in the French-Canadian breed, the two-year-olds must produce 4,400 lbs. milk and 198 lbs. butter fat; the mature, 6,800 lbs. milk and 306 lbs. butter fat.

Guernseys, two-year-olds, 5,000 lbs. milk, 200 lbs. butter fat; mature class, 8,000 lbs. milk, 320 butter fat.

Holstein-Friesian, two-year-olds, 7,500 lbs. milk, 255 butter fat; mature 10,500 lbs. milk, 357 butter fat.

Jersey, two-year olds, 5,500 lbs. milk, 375 butter fat; mature, 8,000 lbs. milk, 400 butter fat.

Shorthorns, two-year-olds, 4,000 lbs. milk; 140 lbs. butter fat; mature, 5,500 lbs. milk, 192 butter fat.

FEEDING FOR MILK.

Foods vary widely in their nutrition value. Also the nutrition requirements of cows vary as they pass through their periods of lactation.

Cows must be fed to their full capacity to obtain the most profitable returns, but there is always a necessity that we feed so much roughage that the grain will not injure the cow. The roughage is absolutely necessary to maintain the health of the cow and enable her to make the most efficient use of her grain ration. It is safe feeding to allow the cow two pounds of roughage or every pound of grain. If the cow will eat twenty pounds of good roughage with ten pounds of wholesome grain feed, there is no danger of impairing her digestion. It is diffi-

cult to estimate ensilage by weight, but a safe rule to follow is to count three pounds of corn ensilage as one pound of dry hay or fodder.

An excess of rich grain is always dangerous to the cow's digestive organs. Roughage grown on the farm is a valuable milk producer and should her capacity for consuming this be lowered a valuable source of revenue will be destroyed.

What the successful dairy farmer must have is a herd of cows that will take his farm grown feeds and some grain from outside sources and convert it into a profit for him.

HAY AND FODDERS

Good alfalfa hay is the best roughage for milk production. In composition it compares very favourably with bran but having a higher percentage of fibre which affects the digestibility of the other constituents one is hardly justified in saying that it is equal to bran in producing milk. It needs to be harvested just as it is coming into bloom to give the best quality of hay. It can be used to replace with profit a considerable part of the grain allowance in a ration. Red clover hay has a high percentage of digestible protein. It can be fed to advantage to dairy stock of all ages, in fact for young animals it provides a well-balanced ration by itself. Alsike clover, though not so palatable and acceptable to the cows as is clover is of almost equal value for milk production. Sweet clover must be cut early to make good hay and can be used only with cows that have acquired a liking for it. Where clover meadows have been killed a hay made from peas and oats cut green form a good substitute for clover. Timothy, though widely used, is too low in protein to stimulate milk flow. Fed along with oil meal it gives fairly good results. Corn silage has become a standard food in dairy districts on account of its cheapness and succulence. It keeps the digestive system of the cow in good order during winter. It is not a perfect ration in itself, being too bulky, and requires grain or oil meal to keep up the milk flow. Roots are, like silage, a cheap food, but are very palatable and keep the digestion in good order. Mangels are more satisfactory than turnips or carrots.

GRAINS AND BY-PRODUCTS

No other single grain or meal ration will give as good results as oats. They are often too high in price to feed exclusively and it is well to use along with them, bran, oil cake peas or corn, depending on the market prices. Corn is a concentrated source of nutriment, very palatable and readily assimilated. Pure corn meal is rather heavy but if mixed with cut feed can be fed in considerable quantities. Barley, when well ground and mixed with other and lighter meals, is valuable for milk production. It should never constitute more than half the meal ration. Wheat bran, as a concentrated feed for dairy cattle, has no equal as it furnishes protein and ash, both essential in milk production. Oil cake has a beneficial effect on the digestive tract, giving the animal a pliable skin and sleek coat. Not more than two or three pounds per day need be fed to a 1,000 pound cow. Gluten feed is worth about the same as wheat bran from the milk production standpoint, but it is not nearly such a safe feed to use.

WINTER RATIONS

The following ration is given by the Ontario Agricultural College as a standard for a 1,100-pound cow giving 25 pounds milk per day: silage, 35 lbs; clover hay 10 lbs.; bran 2 lbs.; oats 2 lbs.; oil meal 1 lb.

The Dominion Experimental Farms recommend the two following rations for the Maritime provinces, Ontario, Quebec or British Columbia: Roots, 50 lbs.; clover hay, 20 lbs.; oat straw, 5 lbs.; meal mixture made of bran, 500 parts; oats, 200 parts; corn, 300 parts and gluten meal 300 parts to be fed one pound meal to each four pounds milk produced.

Corn silage, 40 lbs.; oat chaff, 5 lbs.; alfalfa hay, 8 lbs., meal mixture made of bran 500 parts, gluten 200 parts, oil cake meal 300 parts, barley 200 parts, to be fed one pound to four pounds milk produced.

Rations for 1,200 pound cow in prairie provinces as follows:

Corn silage 30 lbs.; Western rye grass, 10 lbs.; oat chaff, 10 lbs., meal mixture made of bran 300 parts, oats 300 parts, flax 200 parts and ground small wheat 200 parts, to be fed one pound to three pounds milk produced.

Brome hay, 12 lbs.; alfalfa, 5 lbs.; oat straw, 10 lbs.; wheat chaff, 5 lbs.; meal mixture made of oats 500 parts, barley 200 parts, frozen wheat 200 parts, flax 200 parts, to be fed one pound meal mixture to three pounds milk produced.

CALF MEALS

If good calves are to be raised, and that is the only way in which a high class herd can be maintained, it is necessary to feed some milk, particularly when the calf is very young. Therefore, calf meals are to be used as supplements to milk rather than as entire substitutes for it. Until calves are at least ten days old they should be fed whole milk. After this time skimmilk may be gradually substituted for the whole milk and should be continued in the ration as long as practicable, preferably until calves are several months old.

A mixture which has given fairly good results has been tried at the Pennsylvania Experiment Station. This is made up of thirty pounds wheat flour, 25 pounds cocoanut meal, 25 pounds skimmilk powder, 10 pounds oil meal, and 2 pounds dry blood. It is fed by mixing one pound of the meal to six pounds of warm water.

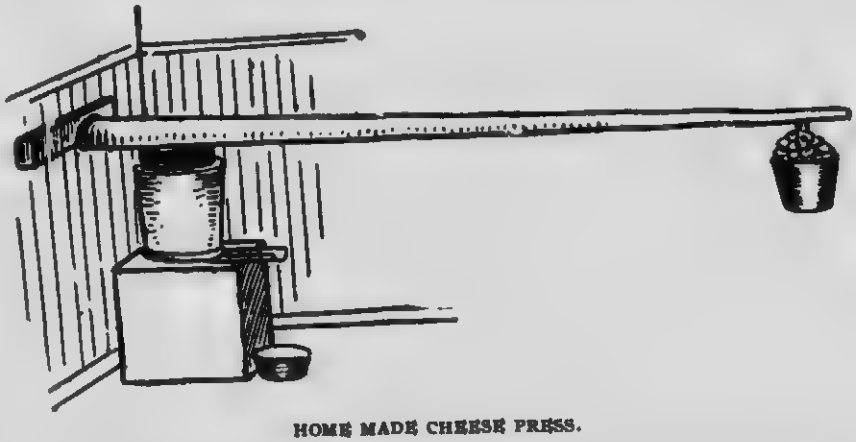
A very successful calf meal is that used at the Purdue Experiment Station. This is made up of equal parts hominy, blood meal, oil meal, and red dog flour. It has an average composition of 10.41 per cent. moisture, 89.59 per cent. dry matter, 36.45 per cent. protein, 45.7 per cent. carbohydrates, 4.59 per cent. fat, and 2.85 per cent. ash. Calves fed this meal have made very satisfactory growth. They were vigorous and strong and have matured into good animals. The following recommendation is made concerning the feeding of this meal:

"When used in the place of milk, home-mixed calf meal should be mixed with warm water (100 degrees Fahrenheit), in the proportion of one pound of calf meal to one gallon of warm water. In case less than one gallon of the mixture is used per feeding, make the necessary reduction when mixing, as it is not advisable to have the meal mixed previous to the time of feeding. If the calf is drinking readily from the bucket, substitute for a small portion of the milk at each feeding an equal amount of gruel prepared by mixing the calf meal as suggested above, gradually increase the amount of gruel fed, placing the calf on this mixture, exclusively, at four or five weeks of age. Do not feed over one gallon of the mixture per day previous to the time the calf is one month of age unless the calf is very large at birth. After this time gradually increase the liquid ration to one and one-half gallon per day at five or six months of age. Home mixed calf meal is a very concentrated feed and in order to be successful in its use it is necessary to make all changes in the amount of material fed gradually. Over-feeding is responsible for much trouble in calf-raising and the careful

feeder will gradually guard against this source of trouble. The same precaution should be observed as if milk were being fed.

MAKING CHEESE AT HOME

Cheese can be made on the farm in about four hours from the time the rennet is added until the curd is in the press. The milk may be night's and morning's milk mixed, or either alone, but should be sweet and clean in flavor. Heat the milk to 84 or 86 degrees Fahrenheit, by setting on the stove or by warming a part of the milk in hot water to a temperature high enough to bring the whole lot to 84 or 86 degrees. Add four to six teaspoonfuls of rennet for each ten gallons of milk (one hundred pounds) after first diluting in a cupful of cold, clean water. Stir the rennet thoroughly through the milk, taking about three minutes to do so. Now allow the milk to set perfectly still until it is coagulated or curdled. To know this, insert finger or thermometer carefully into the curd, and when it breaks clean over the finger or thermometer, it is ready to cut.



HOME MADE CHEESE PRESS.

Next cut into cubes about one-half inch in size or as nearly this as possible Stir gently for five minutes, then set on the stove, or take out sufficient whey, and heat it so as to bring the whole mass to 94 or 96 degrees Fahrenheit· or a pail of hot water may be set in the curd and whey and the whole stirred until the curd becomes cooked. When the curd feels firm and will fall apart after squeezing in the hand, the whey or liquid part may be removed, or the curd may be dipped on to a cheese cloth spread on something to assist drainage. A rack set in a vat or tub is best.

Stir the curd often enough to keep it in small particles, and when the surplus moisture is drained away, add salt at the rate of two to four ounces (according to taste) for the curd from ten gallons of milk. Stir the curd and salt until both are well mixed, when the curd is ready for the hoop. It is most convenient to use a "bandager," which has the bandage on the outside, and after filling the hoop, the cotton bandage remains inside and around the curd after removal of the bandager from the hoop. But where this is not practicable, the curd may be filled directly into the hoop and the cotton bandage be put on after pressing for an hour. Put piece of cloth on top, then proceed as follows: Press gradually for an hour, then remove from the hoop and put on bandage, or straighten bandage, if already on. Trim the edges and have the cheese as neat as possible when

put back to press. Continue pressing for twenty-four hours, when the cheese may be removed to a cool room (not over 65 degrees Fahrenheit). Turn daily for one to three months, when the cheese will be ready to use. Cut pieces in circular form from one end and place the first, or rind circle, back on the cheese to prevent drying.

CREAM CHEESE

The following is the method of making cream cheese as practised in the Dairy Department of the Ontario Agricultural College:

Use any quantity of cream testing about 22 per cent. fat. The cream may be either sweet or slightly sour.

Add rennet at the rate of five drachms to 100 pounds of cream. Do not use a larger proportion of rennet than the foregoing, as the cheese when finished are liable to have a strong rennet flavor which is not desirable.

When the cream is at a temperature of 60 degrees to 65 degrees F. add the required amount of rennet. In about four hours the coagulation will be firm enough, depending on whether or not the cream has been pasteurized. If pasteurized, a longer time will be necessary for the coagulation, and a little culture (sour skim-milk) may be added with advantage.

When coagulated, pour into dry cloths placed over bowls and hang up to drain in a cool, draughty place. The cloths should be of close duck material. It is better not to put too much in one cloth, as it is likely to develop too much and before draining is completed.

A few hours later open out and scrape down the sides to assist the draining, hang up again; repeat the scraping at intervals of about three hours or until the cheese are ready to mould.

When the cheese are ready to mould, the cream should be of a stiff, pasty consistency, but not sticky. Salt is now added at the rate of one ounce for every four pounds of cheese. Sprinkle the salt over the cheese and work in with a knife or spatula.

The cheese are now ready to mould. Line the tin moulds with wax paper and press the cheese in with a knife or spatula. When the mould is full, fold over the ends of the paper and shake out of the mould or tin.

When finished, the cheese should be kept in a refrigerator or cold storage until sold.

The size of the tin moulds used is 3 1-2 in. x 2 1-16 in. and 1 1-8 in. deep. This holds approximately one quarter of a pound. One gallon of cream testing about 22 per cent. fat will make fifteen of these cheese.

COTTAGE CHEESE

Cottage cheese, sometimes called Dutch cheese or schmierkase, is made from skim milk. A small amount of buttermilk may be added. To make cheese, allow the skimmilk to become sour and curdled. Heat it then to from 90 to 100 degrees Fahrenheit in about thirty minutes. After reaching the desired temperature remove the vessel from the source of heat and leave the curd in the hot whey for about fifteen minutes. Then remove the whey by pouring the heated clabber into a cheesecloth bag or on a draining rack (made out of wire screen with cheesecloth spread over it) and allow to drain until no more whey appears. The higher the temperature to which the clabber is heated, or at a like temperature, the longer the time of heating and the longer the curd remains

in the hot whey, the harder and drier the cheese will be. By regulating the time and temperature we can always produce cheese of the desired consistency.

The yield is about fifteen to twenty pounds from one hundred pounds of skim milk. Before using or selling, the curd must be worked thoroughly and some salt and cream added. The amount of salt depends upon the taste of the consumers; two ounces to each ten pounds of cheese is a medium amount. Adding cream greatly improves the flavor of cottage cheese. One pound of cream to ten pounds of cheese is a fair ratio. In a cool place cottage cheese may be kept for several days. The softer the cheese the sooner it will spoil and sour Always use good, clean skimmilk; do not let it become too sour.

A FARM CREAMERY

A building 12 feet x 12 feet will not be too large for a farm creamery, especially if room for a refrigerator is taken out. If a balloon frame of 2 in. x 4 in. scantlings is made, there ought to be a boarding of inch lumber, then one or two ply of building paper, then matched lumber inside and planed boards with battens on the outside, and the air space at the top and bottom between the studs should be made as tight as possible in order to make a "dead" or "still" air space in the wall which is the best non-conductor of heat and cold. It is better still to fill this space with planer shavings or asbestos, though this will add to the cost. The ceiling should be finished with two ply of lumber, and one or two ply of paper between. The concrete floor slopes two inches to the gutter.

Have the air circulate from the ice to the refrigerator, which is most conveniently placed between the ice house and the creamery or working room. By this plan the ice does not need to be moved for cooling the refrigerator, thus saving labor. The walls of both ice-house and refrigerator need to be well insulated for good results on this plan.

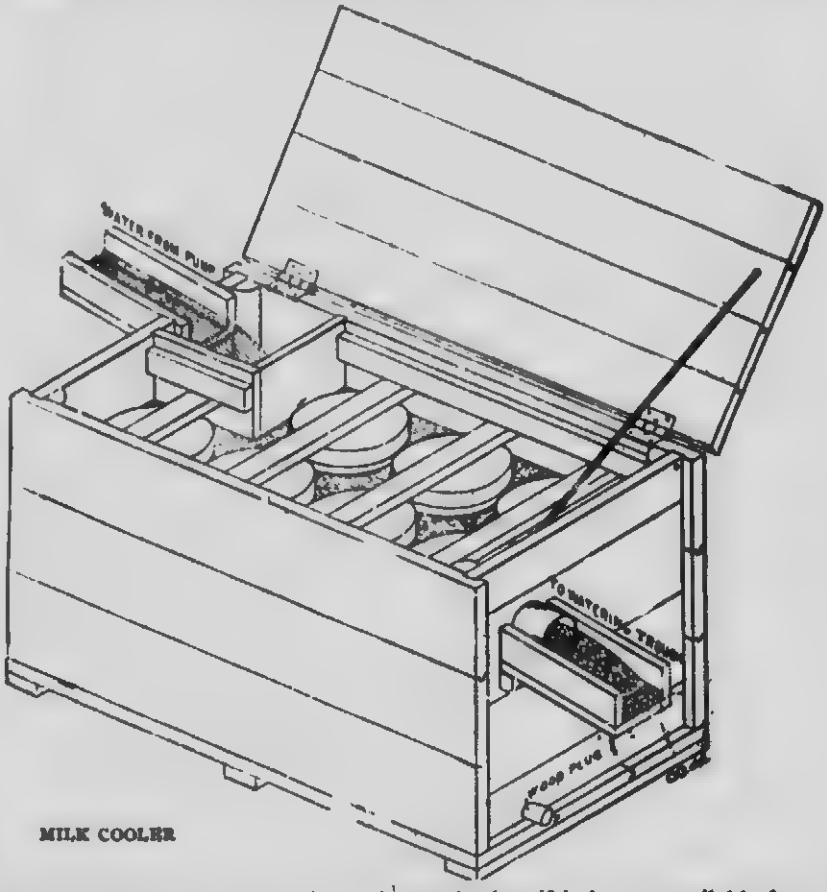
Where a small refrigerator only is required and where the supply of ice is kept in a house and covered with sawdust, as is the custom on most farms, it would be most satisfactory to purchase an ordinary house refrigerator of the desired size and keep this in one corner of the small creamery. This refrigerator can be filled from the ice-house as may be required. An ice box might be made in one corner of the work room, or be built under the ice, where the ice-house adjoins the creamery, but such an arrangement is likely to produce dampness in the cool chamber, which means mouldy butter.

OVERRUN IN BUTTER-MAKING

The amount of butter to be obtained from any quantity of cream depends on the "overrun" (i. e. the excess of butter over fat in milk or cream). Taking, say 100 pounds of cream that tests 40 per cent. butter fat, if the overrun be 15 per cent., there should be 46 pounds butter. One hundred pounds of cream testing 40 per cent. fat contains 40 pounds fat. Fifteen per cent. of 40 is 6. This six added to 40 gives 46, which is the weight of butter there would be with a 15 per cent. overrun. If the overrun were 20 per cent. then there would be 48 pounds butter. No one can tell exactly how much the overrun will be with any given churning. In good creamery work, the overrun ranges from 12 to 18 per cent. in a whole milk creamery, and from 15 to 20 per cent. in a cream-gathering creamery. We hear of cases of 25 and 30 per cent. overruns, but they are usually imaginary, or the weights and tests have been "cut," or the persons are making illegal butter, i. e., butter with too much moisture in it.

DEEP SETTING OF MILK.

The deep setting method is a very decided improvement on the shallow pans. The best results, both as to quality and effective creaming, are secured by putting the milk, as soon as drawn, into cans about 8 inches in diameter and 20 inches deep. The cans are then placed in a tank containing ice water, and left for at least 24 hours before skimming. The tank will require to be 24 inches deep and large enough to hold as many cans as the herd will fill at two or three milkings. The tank must be water-tight and provided with a three-inch overflow 17 inches from the bottom, and also a plug at the bottom to drain off the water for cleaning. The tank should be fitted with a cover, and the whole protected from the weather. It would be folly to use the deep setting method without ice in this country,



MILK COOLER

where it can be put up so easily and cheaply, but if it is not available for any reason, the next best thing is to have the tank placed near the well, so that all water used for various purposes may be first pumped into the tank, as shown in the illustration, and then allowed to overflow into the stock trough or other receptacle. If ice is used, running water in the tank would only waste the ice.

FARM BUTTER MAKING.

Hand separator cream produces better butter than that separated by any other method. The deep can (shotgun can), surrounded by cold water, is second best; pans and crocks are third best.

The cream should be kept in as nearly sweet condition as possible until enough has been gathered for a churning. This should then be soured or ripened. To ripen, place where it will become somewhat warmer (at a temperature of 75 to 80 degrees), until it is sour enough; then cool down to a temperature of from 55 to 60 degrees, which is right for churning. If allowed to stand at this temperature for an hour or so before churning, it will cause the butter to come in better condition. Cream that is being ripened should be thoroughly stirred several times before it is ready for churning.

It is often advisable to save some of the buttermilk of one churning to be used as a starter (the same as yeast in bread making) for the next batch of cream. Add a small amount of this old buttermilk to the cream, stir it thoroughly, and it will ripen very much more readily. Care should be exercised to keep this old buttermilk in as good condition as possible. This method of cream ripening will be found excellent for the winter months.

Strain all cream into the churn. This will remove all clots and particles of curd, and there will be no danger of white specks in the butter. Do not fill the churn over one-third to one-half full. Turn the churn just fast enough to give the cream the greatest amount of agitation. In case a barrel churn is used, turn it so the cream has time to fall from one end to the other with a distinct thud.

The butter should be gathered until the grains become more than half the size of a grain of wheat. After drawing off the buttermilk, pour a pailful of cold water in the churn over the butter and give the churn four or five quick revolutions. Then draw off the first wash, put on the second and turn as before. If the butter is hard enough after the second washing, draw it off and take out the butter. The washing of the butter removes the buttermilk and puts it in better condition for salting.

The butter should be taken from the churn in the granular condition and the salt added before it has been worked together. Usually about one ounce of salt is added to each pound of butter. The salt should be worked through the butter with a ladle or paddle and not with the hands. One working, at the time of salting, is usually sufficient, providing the butter is hard enough to finish. If the butter is somewhat soft when taken out, it can be salted and set away for a few hours until it gets hard enough to finish. Butter is usually worked enough when the water has been removed so that the butter will bend without breaking.

Pack or print the butter as soon as it has been worked sufficiently and put it in a cool place until it is taken to the market. Remember that the appearance of the package as well as the way the butter is packed has a great deal to do with the selling price.

COMMON FAULTS IN BUTTER.

Strong flavor is perhaps the commonest fault in butter, and for this there are several possible causes. In the first place the cows may be receiving some food that is not sweet, or their water supply may be impure. Cows at pasture, particularly when first turned out in spring or early summer, sometimes pick up unsuitable food, such as young growth on hedges and various objectionable weeds, amongst which may be mentioned ivy, wild mint, garlic, tansy, and buttercups. In the autumn, too, decayed leaves may be taken up with the grass and cause taint in the butter. Then of the foods ordinarily fed, excessive quantities of swedes, turnips, cabbages, or brewers' grains may produce strong flavor. During the process of milking, the milk may become tainted owing to the impure air of dirty and ill-kept stables, and the chance is increased if the

milk is allowed to stand about in the pail instead of being removed promptly to a cool dairy. Bad drains about the cow stables and dairy may also cause taint. In some cases, especially in small dairies, the apartment is not kept solely for dairying, but more or less strong smelling articles are kept or stored there, resulting in an unpleasant flavor in the butter. Over-ripening of the cream also causes strong flavor, as does uneven ripening, the result of not stirring the cream during the process. Unclean utensils are another cause, as any stale cream left adhering to the cream pan or stirrer quickly causes uneven ripening and taint. Old and worn out churns, too, are sometimes productive of bad taste in butter, as the wood is too soft and porous to be cleaned properly. Lastly, taint may be taken up by the butter from odorous packing materials, such as improper paper used instead of butter paper, new deal boxes, and leaves used as wrapping material.

Improper salting is another fault which appears frequently. This generally takes the form of uneven salting, or the use of impure salt. Only the best dairy salt should be used, and it requires to be dredged on evenly in a dry state. Uneven salting results in streakiness and in the formation of drops of water in the butter. Uneven salting, combined with too little working, is certain to result in these objectionable drops of water, because water forms where the patches of salt dissolve, and it can be pressed out only by more working. After salting, the butter should be worked a little, and then left for about an hour for the salt to dissolve before the final making up. A half ounce or more of salt to the pound of butter is generally required, though tastes differ in this respect. In any case, the salt should be carefully weighed out and evenly distributed. It should also be stored in a dry place.

Bad texture or grain may be caused by uneven ripening of the cream, uneven salting, or impure salt, and by churning at too high a temperature. Exposure of the milk, cream, or butter to strong light also results in streakiness, and is therefore to be avoided. Butter of a hardy texture may be produced by overworking, and butter of too open and spongy a character by too little working. Churning should be stopped when the grains of butter are the size of wheat grains. This, with stirring during ripening, even salting, correct working, and a proper temperature in the dairy should produce butter of good texture.

Poor color can generally be remedied by some alteration or improvement in the diet of cows. Oats usually produce a good color, as does the addition of a few carrots or turnips to the rations. Linseed cake or good undecorticated cotton cake are recommended. Excessive mangold feeding produces pale butter. As mentioned above, exposure of the milk, cream, or butter to strong light spoils the color.

The general appearance of samples very often leaves much to be desired. Negligence in this respect indicates carelessness in other operations of butter-making. The butter should be worked up into a neat shape or block, and may with advantage be ornamented with some good design. In any case, it must be securely packed and wrapped in the best butter paper, care being taken not to use anything of an odorous nature.

A HOME-MADE STARTER.

Much of the difficulty in getting butter in the fall of the year might be overcome by the use of starters to be added to the cream twelve hours before churning. A starter may be made from skimmilk. That from a fresh cow gives the best. Place the skimmilk in a closed earthenware or glass vessel, or clean tin will do, and keep it at a temperature

of from 80 to 90 degrees until it is loppered, or has a slightly acid taste. If the quantity thus prepared is not enough, get some clean skimmilk and pasteurize it by heating up to 165 degrees and hold it there for twenty minutes. After it has cooled to about 75 or 80 degrees, add it to the starter already made and allow it to stand at that temperature for a few hours; then cool down as low as convenient. It is now ready to be added to the cream, which should be held till ripe at a temperature not lower than 60 degrees.

PREPARING FOR CHURNING.

When cream from several separations is collected, the churning should not be made for a number of hours after the addition of the last batch of cream. Unless this time is given, the fresh cream added will not have soured, although it will be mixed throughout the mass of sour cream, and if churned in this condition much butter-fat will be lost in the buttermilk. Time must be given for complete and thorough blending of the various lots so that they are practically one, the acid being developed in all alike. This may be done very nicely by taking the previous night's separation as the last and churning the next day, thus giving ample time for the proper ripening of the last cream added.

During the last few hours of ripening there should be taken into consideration the temperature at which the cream must be churned. When it is completely ripe or has reached that point where the flavor is fine and the aroma good, it should be quickly brought to the temperature necessary for churning, if not already at that temperature. If it has to be lowered several degrees, it should stand at the churning temperature for a period of three or four hours before churning. This becomes necessary because butter-fat is a poor conductor of heat and takes longer to change in temperature than the milk serum. Every one is familiar with the fact that oils and fats cool very slowly. During the process of ripening, the cream should be stirred occasionally to obtain best results.

MAKING BUTTER IN WINTER.

Butter-making in winter is not very different from making butter in summer. It might be said that in winter, cream is ripened and churned at high temperatures. In summer, more care is needed to keep the cream from becoming too warm and sour; in winter, if cream is kept too long and at too high a temperature it is apt to become bitter.

After the cream is ripened it is ready to churn. The first step is to cool the cream from 65 degrees Fahrenheit, the temperature at which the cream is ripened, to about 55 degrees Fahrenheit in the summer, and to 58 degrees Fahrenheit in the winter. If at these temperatures, the butter should come in too minutes and if the butter is soft, the next churning should be cooled somewhat lower, say two degrees; on the other hand, if the cream is slow in coming the temperature should be raised. A gallon of cream should be heavy enough to churn three pounds of butter.

When the butter is well drained from buttermilk, rinse it with a little water at a temperature of 55 degrees Fahrenheit. After this is drained away, put the cork in the churn and add a half pailful of well water to every 15 pounds of butter, put the cover on the churn and revolve it slowly at least six times; then draw off the water and let the butter drain for fifteen minutes.

SWEET CREAM BUTTER

To make sweet (cream) butter, churn the cream before it turns sour. The cream is kept sweet by churning frequently, preferably every day, and by keeping the cream cold, as this prevents the growth of lactic acid bacteria, which causes the cream to sour.

When churning sweet cream have the temperature from two to four degrees colder than for sour cream churning, and take a few minutes longer to churn than for sour cream. This is done to prevent excessive loss of fat in the buttermilk. If the sweet cream be pasteurized, there will not be any great difference in loss of fat in the buttermilk, whether churned sweet or sour.

The other steps in churning sweet cream are similar to those for ordinary churning, except the salting. If the mild, creamy flavor of sweet cream is desired in the butter, salt more lightly than usual—say one-quarter to one-half ounce of salt per pound of butter, instead of the usual ounce of salt. In some cases, the second washing is done with brine and this leaves sufficient salt in the butter for those desiring a mild flavor. The churning of sweeter cream is to be commended, as very sour cream gives an unnatural flavor to the butter, lessens the demand for butter and, consequently, is not so favorable for the butter-making industry.

BUTTER WORKER

The best style of butter worker is one V-shaped, with lever in the centre. The worker should be from three to four inches wide at the narrow end, and from two to three feet wide at the other end, and about three feet long. The two sides should be about four inches deep. The bottom should be made of tongued and grooved material. The worker board should sit on a three-legged frame, made firm and of such a height that a person can work the butter without stooping. It should be about three inches lower at the narrow end for the water to run off. The lever is fastened at the narrow end into a cross-piece of wood or iron, having an opening below for water to run through. The lever may be found or six-sided, with a handle at the near end. Any kind of wood is suitable which will not taint the butter or warp when wet. Spruce would be quite suitable for the bottom and sides, while the lever might be made of birch.

BRINE-SALTING BUTTER.

Brine used for brine-salting butter is made by dissolving as much salt in water as is possible. Salt should be added to the water until no more of it will dissolve. If the water is warm, a saturated solution of the salt may be made quicker than by using cold water. A sufficient amount of salt should be added to the water so that after considerable stirring and standing a layer of undissolved salt remains on the bottom. This saturated solution of salt is then poured into the churn after the buttermilk has been drawn off and the granular butter slightly washed. A sufficient amount of brine should be used to float the butter.

The granular butter is then revolved in the churn in this brine, the brine drawn off, and the butter worked and packed for market. Butter which has been brine-salted in this way usually contains considerable less salt than when dry salted, but there is no danger of mottled butter when it has been brine salted. The amount of water in butter is increased by leaving a portion of the brine in the churn during the working, and working the butter in this brine. The objec-

tion to brine-salting butter is the increased expense, as the brine is seldom used but once and there will necessarily be a large loss of salt in the brine which is drawn off from the butter. It is possible that this brine might be used more than once if a person is careful and adds more salt to the brine after it had been used the first time. The brine will, of course, be diluted somewhat each time by the amount of water which works out of the butter into the brine. On the whole, however, brine-salting is usually considered a waste of salt. It also makes a very light-salted butter as brine does not stick to the butter in so large quantities as dry salt.

SALT ON SURFACE OF BUTTER.

When butter becomes unusually dry, the salt is precipitated from its solution in the water in the butter, and appears as crystals on the surface. The cause of the appearsnce of the salt on the outside is that the evaporation of the moisture from the butter goes on at the surface, and as the surface dries, the moisture from the interior flows to it by the usual process of diffusion of liquids in porous substances, and thus more salt is brought to the surface, and as more moisture is evaporated, still more salt is deposited. The remedy is simple—merely keep the butter in a sufficiently damp place to avoid evaporation. Or it may be dipped in cold water, by which the salt will be easily removed. This trouble is also due to the imperfect mixture of the salt in the butter, and probably to some extent also to the use of coarse salt. The finest ground salt only should be used and it should be thoroughly worked through the mass of butter. It is not advisable to work the butter too dry: at least 12 per cent. of water should remain in the butter when it is finished. This water, being diffused evenly, gives the desirable waxy texture to the butter when it is cut or broken.

KEEPING BUTTER FOR WINTER.

Butter may be kept for winter use by pouring brine over the butter put into a crock each week. This excludes the air and prevents the butter going off in flavor. If the brine becomes stale, or bad-flavored, fresh brine should be made from time to time.

The cause of mould is that the germs (seeds) of mould drop or get on to the butter from some place and cause the trouble. The seed usually develops in damp places. If the walls of the room be thoroughly cleaned and sprayed with a germicide such as bi-chloride of mercury (corrosive sublimate) in the proportion of 1 to 1,000 of water, there is little danger of mould. As this substance is very poisonous, care must be exercised in its use. Formalin may also be used.

FROTHY CREAM.

Frothy cream that will not churn into butter is a trouble that is common in winter, due most probably to the action of harmful bacteria. They may come originally from the cow, from her feed, or more likely from the surroundings where milk and cream are kept. The remedy is pasteurization or heating the cream to a temperature which destroys all bacteria, or nearly so; then we introduce a good kind, which, having a clean field, grow very rapidly and produce proper ripening of the cream and ease of churning.

BUTTER THAT IS TOO HARD.

Butter from Jersey cows is frequently too hard in winter because the Jersey gives naturally a firmer fat than is found in the milk produced by cows of other breeds. This hardness is a commendable quality in summer butter, but is apt to be objectionable in winter. The feed of the cow has quite an important effect upon the hardness of the milk fat. Chemically, the hardness of butter is determined by ascertaining what is known as the "melting point"; the higher the "melting point," the firmer the butter. As the result of a number of tests conducted at the Ontario Agricultural College with various feeds, it was found that the average melting point of butter produced by the feeds mentioned below was as follows:—

	Degrees.
Pasture	32.36
Corn Silage	31.56
Hay and Oil Cake	33.60
Hay and Cottonseed Meal	36.56

All succulent foods, like roots and silage in winter, and grass or soiling crops in summer, tend to produce milk with softer milk fat. Avoid cottonseed meal. In the second place, have the cream warmer than usual at the time of churning by two to four degrees. After the buttermilk has been drawn off, wash the butter in comparatively warm water. For instance, if churning has been done with the cream at 60 to 62 degrees, wash the butter in water at a temperature of 60 to 64 degrees Fahrenheit, or two to four degrees higher than churning temperature. If a worker is used which will hold water during the working process, have a moderate amount of warm water in contact with the butter at the time of working the butter. If the worker will not hold water, then water moderately warm (60 to 64 degrees Fahrenheit) may be poured over the butter as working proceeds. This will tend to cause a certain amount of the water to be taken up by the butter. Churning the butter into large lumps in the buttermilk also tends to produce softer butter and butter with more moisture in it. Aim to retain about 15 per cent. moisture in the finished butter, but be careful not to exceed the legal standard.

CAUSE FOR SOFT BUTTER.

It is a common belief that soft butter in spring is due to the large amount of water in the new grass. Some feeders have even gone so far as to cut down on the amount of water allowed in this season, thinking it would improve the product. The fact of the matter is the water has no effect on the condition of the butter, but the change is due to the butterfat itself.

Butterfat is composed of two kinds of fats known as volatile and non-volatile. Each of these in turn is made up of a number of substances called fatty acids, but which for convenience we will speak of as oils.

The non-volatile oils are six, and their relative amounts in the butter-fat largely cause the variation in hardness and softness of the butter. The most important of these oils is olein, since it has been found to be present in the greatest proportion during spring when the cows are on grass. Olein has a much lower melting point than the other oils, and consequently an increase in its amount causes the butter to melt at a much lower temperature. We can readily see the cause for soft butter in the spring is not the water in the grass. In fall or winter when normal feeds are given the percentage of olein is less, the melting point is higher, and we have a firmer, harder product from the churn.

Cutting down on the cow's water supply because the grass is soft does not make the butter harder; it only cuts down on the amount of milk your herd can produce.

WHY CREAM TESTS VARY?

There are many reasons for the variation of the test, and, unfortunately, these reasons are not generally known. The variation may be expected, although there may not have been any change in the position of the screw which regulates the thickness of the cream.

As the season advances in the spring, there is a gradual reduction in the fat test of the milk, until it is at its lowest during the hot months of July and August. Whenever the per cent. of fat in milk is reduced, the cream test goes down also. For instance, if a 38 per cent. milk is separated into a 38 per cent. cream, then a 32 per cent. milk run through the same separator would give a 32 per cent. cream.

Sometimes there is a sudden reduction in milk test because of several cows freshening at the same time. Such milk ordinarily will be lower in test than the milk from the cows well along in their lactation period. The milk, because of being lower in fat test, will then produce a lower testing cream.

There are several other factors that cause cream tests to vary, among which is the speed of the separator. Ordinarily, the speed is fairly uniform, but even with care there is apt to be a slight variation. An increase of speed usually produces a higher testing cream, while a decrease of speed produces a lower testing cream, as well as inefficient skimming. The biggest change in speed is brought about when there is a change in persons operating the separator.

The rate of milk inflow also influences the fat test of cream. When the separator tank is kept well filled and the faucet is turned on full, the cream test will be lower than when the milk stands low in the supply tank or the faucet is wide open. If a small amount of high testing cream is desired, the simplest and easiest way to produce it is to cut down on the rate of milk inflow by partially closing the milk tank faucet.

The amount of flushing of the bowl influences the cream test. The more skim-milk or water that is used, the lower the test. Other factors, such as temperature of the milk, cleanliness of the bowl, and balance of the bowl, have their influence upon the fat per cent. in cream, and may play an important part in causing it to vary.

PASTEURIZATION OF MILK

The milk for pasteurization must be clean and sweet. Pasteurization is not, and cannot be, a remedy for dirty milk. If the milk contains over 25 per cent. of acid, there is danger of it curdling when heat is applied. If the milk is produced in a cleanly manner and cooled to 50 degrees Fahrenheit soon after milking, there is no danger of curdling when heated, where pasteurization once a day is practised. Fresh milk, of course, may be pasteurized without trouble. The following is the method adopted in the dairy department of the Ontario Agricultural College, Guelph. The night's and morning's milk is mixed in the weigh can and from there it runs to the receiving vat. From the receiving vat, the milk runs by gravity to a continuous pasteurizer, which is heated with exhaust steam from the engine in the dairy, hence at practically no cost. The milk enters at the bottom of the pasteurizer, and is forced by paddles against the heated surface of the machine. The steam is contained between an inside

and outside jacket made of copper. As the milk rises, it is warmed to about 165 degrees Fahrenheit before it leaves the machine at the top. It can be heated to a higher temperature if necessary, but heating above 165 degrees Fahrenheit tends to give a very pronounced "cooked flavor" to the milk, which is not liked by most persons. A thermometer placed at the outlet allows the operator to see what temperature is being obtained. From the pasteurizer, the milk passes through a tinned pipe to a circular water cooler in winter. As it passes over the cooler it is reduced to about 42 degrees Fahrenheit by the time it passes from the cooler into the can. With a large supply of cold water this is one of the most economical coolers that can be used. This milk will keep for several days if kept in a cool place, and not exposed to the air or to dippers, cups, etc., which have sour or partially soured milk on them.

The plan outlined is for pasteurizing milk in large quantities (2,000 to 3,000 pounds per hour), but for handling smaller quantities of milk, what is known as a discontinuous or "intermittent" pasteurization is advisable. The advantage of this plan is that a lower temperature may be used with just as effective results in destroying bacteria, and there is less cooked flavor. In addition, the cream will rise on the milk if not heated above 140 degrees to 145 degrees Fahrenheit. There are special machines of the discontinuous or intermittent type, but as a rule these are not necessary. What is known as a "shot gun can" (a can about 8 inches in diameter, and about 20 inches deep, with handle and cover), is as good a pasteurizer as one needs for this kind of work. A smart man or woman can attend to three or four of these, and can pasteurize 100 to 200 pounds milk per hour. Have a tub, box, or can, large enough to hold three or four of these small cans. Then fill the large can with hot water (180 degrees to 185 degrees Fahrenheit), and stir the milk in the small can with a wire handled dipper, until the milk is heated to 140 degrees to 145 degrees Fahrenheit. Allow them to stand for about twenty minutes at this temperature, then place the cans in the same tub, box or can, having cold water in it now. Stir until the milk is cooled to 50 degrees Fahrenheit or below and allow to remain there until ready to use or ship. If it be desired to make the work more effectual, the milk is heated the second or even the third time and cooled after each heating, hence the name "intermittent." Usually, however, one heating and cooling is sufficient. In special cases the second and third heating and cooling may be advisable. The main points in pasteurizing milk are: 1. Have the milk clean and sweet. 2. Heat to 160 degrees to 165 degrees Fahrenheit in a continuous pasteurizer, and to 140 degrees to 145 degrees Fahrenheit in a can or an "intermittent" machine, by means of hot water or steam. The milk must be kept in motion during the heating process, else it will have a "burned" flavor in addition to the more or less "cooked" flavor, which characterizes pasteurized dairy products. (In our judgment this is a mark of high quality when properly done). 3 Cooling to below 50 degrees Fahrenheit must follow the heating process, either at once or within half an hour after heating. 4. Milk must be kept from re-infection through exposure to the air by means of dirty. or partially sour dippers, etc.

To pasteurize cream, keep it sweet and cold until sufficient is gathered for a churning. This may be kept in a can or crock but we prefer a can—what is known as a gun-shot can is convenient. This is a can made of good tin, about eight and one-half inches in diameter and twenty inches deep. Cream is readily warmed or cooled in such a can or pail.

Have another can or tub with hot water in it at about 180 to 185 degrees Fahrenheit, and into this set the can of cream. Stir until the cream reaches 160 degrees Fahrenheit. Remove from the hot water and allow to stand for

from ten to twenty minutes, preferably having the can covered with a lid. At the end of this time, place the can of cream into a can or tub of cold water and stir the cream until it is cooled to about 70 degrees Fahrenheit. Now add about one pint of good flavored sour skimmilk or buttermilk—preferably got from a culture made from ferment supplied by a laboratory, though this is not practicable as a rule; in which case the churner must either get from a neighbor, or simply allow some skimmilk to sour naturally in a clean place and add to the cooled pasteurized cream. Do not put this culture or starter into the cream before it is cooled, otherwise the hot cream will kill the bacteria in the sour milk and the cream will not ripen. If kept in a warm place with cream can or crock covered, so as to keep out as many as possible of harmful germs, the cream will be ripe and ready to churn in about twenty hours. If this is churned at 69 degrees to 72 degrees Fahrenheit (and be sure the thermometer is correct) there should be no difficulty in getting butter.

MILK SOURING QUICKLY

The souring of milk is due to the action of the germs of lactic acid, which are always common and plentiful wherever there is or has been milk. The only way to prevent the milk from early souring is to guard against the action of these germs. This may be done by brushing the udders, sides and bellies of the cows and wiping them with a moist cloth before milking into thoroughly clean, scalded pails; then straining the milk immediately through two or three thicknesses of scalded cheesecloth or absorbent cotton into cans that have been thoroughly washed and scalded. The milk should be quickly cooled by standing the cans in cold water and stirring the milk while it is cooling. If all pails, strainers, cans and other utensils with which the milk comes in contact are thoroughly cleansed and scalded before use, and the milk is not allowed to become contaminated before it goes into these vessels, the milk should keep for several days if kept cool.

STRINGY OR SLIMY MILK

The "slimy" or "stringy" condition of milk and cream is due to a well-known form of low plant life. Other forms cause discoloration of milk, cream, cheese, etc. The well-known "rust" on cheese is caused by a certain form of bacteria. Most of these are harmless, but are disagreeable. The common "blue mould" is a harmless form of low plant growth, but usually causes the housewife and the dairyman considerable anxiety, because "it looks bad."

The remedy is to pasteurize the cream as soon as it is removed from the milk, following a plan similar to that outlined for frothy cream. If churning but once or twice a week, pasteurize the sweet cream, add a teaspoonful of the culture and set in a cool place until sufficient is gathered for a churning. Be sure to have the fresh cream cooled to below 70 degrees before adding to previous lots.

It will also be advisable to thoroughly scald all vessels that come in contact with milk or cream and pay special attention to cleaning the water tank if setting in deep cans, in order to kill the bacteria causing the trouble.

FOR A TOUGH MILKER.

The following for a tough-milking cow has been recommended by an experienced dairyman: "Make a plug of dry slippery elmwood an inch and a half long and the thickness of a match at the thinnest end. Let the other end

have a head on it similar to that on a horseshoe nail. Tie a piece of silk thread around the head, slip the plug up the teat which milks hard and let it stay until next milking. That teat will give a full, easy stream, but if at any future time it should milk hard, then give it another application. The elm plug swells in the teat. The large head at one end is to prevent further entrance in the teat, as it might by accident get out of sight, in which case the silk thread will be handy to take hold of for withdrawal of the plug."

TO PREVENT SWITCHING

To fasten a cow's tail so that she cannot switch, take a section of spring wire bent to the shape of a pair of tongs. The arms of the clip are bowed out in semi-circular shape near their extremities and the ends are formed into elliptical eyes. A ring encircles the straight portions of the arms and may be pushed forward to squeeze the arms together. In applying this device the bushy part of the tail is slipped into the clip which is then pressed firmly against the animal's leg with the eyes upon opposite sides. The ring is now pushed forward, forcing spring arms together. The tail is thus tightly held between the leg and the semi-circular portions of the clip which are roughened to prevent slipping. The semi-circular portions fit over the tendon of the leg near the upper shin joint and the eye portions sink in the hollow below, between the tendon and the bone.

A SELF-SUCKING COW.

There are several methods of dealing with a cow that takes her own milk. One good plan is to place a leather halter having a wide nose band on her head. This band should be studded with sharp nails or tacks driven through from the inside, and having another strap sewed on over the heads of the nails to hold them in position. When the cow attempts to grasp her teat with her mouth, she will prick her flank, udder or leg and abandon the effort.

Another plan is to put a surcingle around the cow and a halter on her head and join the two by means of a strong piece of wood about four feet long, passing between the fore legs, allowing the piece of wood a few inches of play at the halter end.

Still another plan is to place a ring, similar to a bull ring, in the cow's nose, and hang two other rings in it. When the cow attempts to grasp her teat the rings will come in the way and defeat her object.

BOX FOR SHIPPING BUTTER.

A box to hold forty-eight pounds of butter will be made up as follows: The box itself will be of one-inch dressed pine or spruce, or some equally light and strong wood and will be bound with straps of sheet iron passing right around the ends. It should be painted a light color, and the owner's name or initials and his address also painted on it.

It is important that it be light in weight. The lid will have loop hinges so that it can be lifted off when opened. The handles for lifting the box may be cast iron chest handles, but leather is much better, put on the same way as on heavy trunks.

The trays, four in number, will hold twelve pounds each. The prints of butter will be put up by the use of a mould for the purpose and as the size of these moulds does not vary very much, the tray may be about the following size, viz.: 9½ by 13½ by 2 3-8 inches deep. Four of these together with the ice-box will necessitate a box about twelve by fourteen inches inside measure by about fifteen inches deep. The exact size of these trays and of the box will, however, depend on the exact size of the prints. The material of the trays may be spruce or whitewood or some colourless variety of hardwood. Basswood becomes dirty-looking in colour and should not be used. The depth should be about one-eighth inch greater than the thickness of the mould or print of butter. The sides of the tray should be one-half inch thick when dressed; the bottom may be lighter. In the top of two sides should be notches for lifting the tray. The box should be enough larger than the trays to admit of two quarter-inch strips on the bottom and one up each corner, these corner strips to extend only to the top of the trays.

The size and style of the ice-box is a disputed question. Some prefer one covering the whole inside top of the box, made of galvanized iron with close-fitting cover and about two and one-half inches deep. If the market is at a great distance, this box should have a drain pipe to carry off the water, thus preserving the ice better than if not so drained. This is not necessary for short distance shipping. If print butter can be placed in a cold storage chamber at a low temperature for twenty-four hours previous to shipping, it may safely be transported a distance of fifty miles by express without the use of any ice-box.

COW THAT HOLDS HER MILK.

The holding of milk by a cow when one tries to draw it, is due to nervousness, and the only way to bring about a cure is to treat her so as too soothe her excitement. It is a good plan to give such animals a bran mash to eat while milking is in progress, and to treat her as kindly and quietly as possible. It is also help ful to rub the udder and teats or a few minutes before commencing to milk.

WARTS ON TEATS.

If the warts are long with a small neck, clip them off with a pair of sharp scissors and touch each spot with a stick of lunar caustic. After applying the caustic use olive oil, and the second day repeat the caustic and oil if it seems necessary. Keep well greased with oil until healed.

Another method is to take a silk thread and tie tightly around the neck of the wart. After a few days it will drop off and when this has occurred, apply a little butter of antimony with a feather. If the wart is flat and does not have a neck, scrape the surface with a knife and apply the antimony as directed. If the antimony leaves a wound dress it with a preparation of eight ounces of water, two ounces of catechu, and two drams of carbolic acid. It is best to use a milk tube and draw the milk while applying the treatment.

CAUSES OF BLOODY MILK

Bloody milk is more objectionable, perhaps, as a matter of appearance than as a menace to health. Hemorrhages may occur within the udder as a direct result of a bruise caused by rapid motion, by a bad position while the cow is lying down, by the tread of a cow in an adjoining stall, or because of the breaking of a thin blood vessel or the escape of red corpuscles through thin vessel walls. Heavy feeding may also produce bloody milk.

The remedy is careful milking and light feeding with laxative feeds, and repeated small doses of a mild physic. When the trouble occurs with cows giving a heavy flow of milk and under heavy feed, improvement follows a marked reduction of the ration. A change of stall may give good results, if it allows a cow to obtain a better position and avoid uneven pressure on the udder while lying down. Cows with long, heavy udders should be driven slowly, and should not be driven over high sills.

POULTRY

POULTRY HOUSES

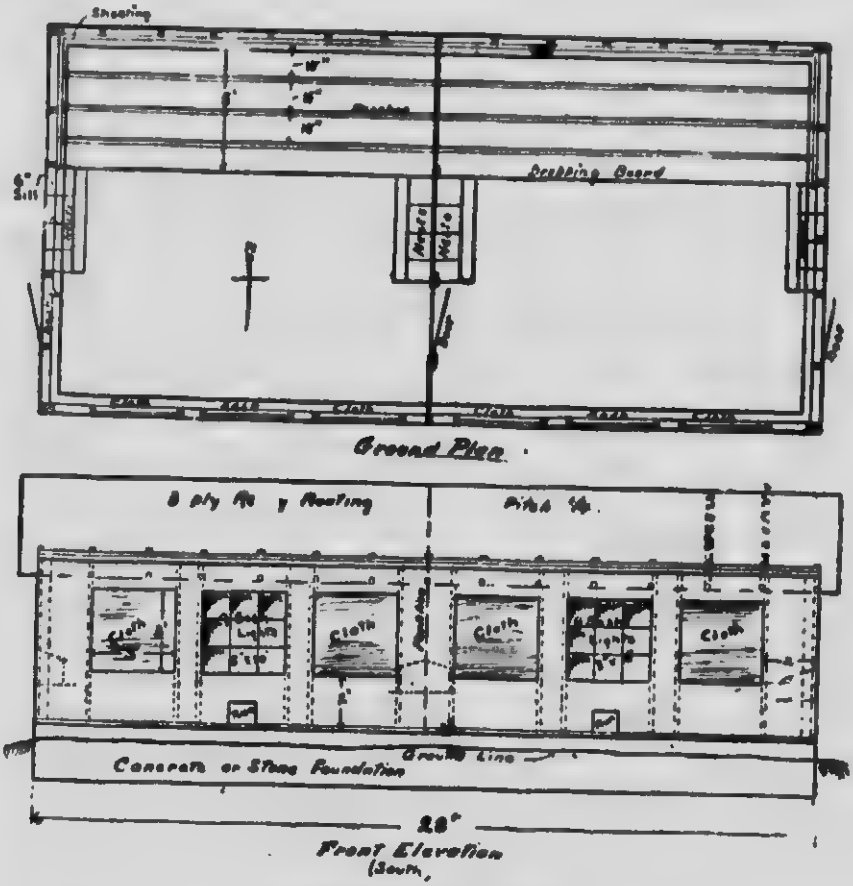
With the variations in Canadian climate it is not possible to design a poultry house that will be suited to all districts. A variety of plans are described in the government bulletins, the two that are best suited for general adoption being the farmer's poultry house for a hundred hens and the movable colony house. When larger flocks are kept, there are other forms known as commercial houses, breeding houses. Essential to all these are comfort, convenience, sanitation and moderate cost.

Comfort means, most of all, a dry house. It need not be very warm but there must not be any moisture. Dampness may be caused by poor drainage, a leaky structure or too many hens to a given cubic area. Bad ventilation is a serious defect and should receive the best of attention. It will seldom be necessary to furnish artificial heat for a hen house in Canada. If the air is dry and the birds healthy they will not be liable to freeze. Of course it will be better if the atmosphere can be kept fairly even and above the freezing point. Equally important is plenty of light. Hens will be healthier and lay better if they have abundance of sunlight. It tends to minimise tuberculosis and vermin pests. Proper arrangement and material for roosts will be conducive to comfort and regard for this feature should be had in placing the nests and feeding accommodation.

Sanitation is closely allied with comfort. Cleanliness is the first desideratum—an imperative requirement to success in poultry breeding—but it is the rule probably most sinned against and consequently filth is responsible for most of the ills the hen is heir to. Fowl do not like foul smells any more than men do and they are as bad for the health of the one as the other. Sand floors, false floors (movable) or floors that can be easily and conveniently scraped and dusted should be provided. The louse is a symptom as well as a pest—an indication of improper care on the part of the attendant.

Convenience relates to the location of the house as well as the interior arrangement for purposes of attendance. As women or children frequently give most attention to feeding the hens and gathering the eggs the houses should be as close as practicable to the family residence and easily accessible. Grain, water and green feed should be available without unnecessary labor. The same conveniences will facilitate matters if the busy farmer or hired help has to look after this work. There will also be less tendency to neglect the chicks. Feed troughs or racks and watering appliances should be on one side of the building and the nests on the opposite side as a rule. It is possible to get at both the nests and the feeding places either from the inside or the outside by passages or under shed cover if this is planned for during construction. Gates, doors and windows that will open both inwards and outwards or that can be removed without difficulty add to the convenience, especially of portable houses. In fact, all fixtures should be fastened, so far as possible, with hooks or hinges or screws, making change or removal easy. The farm or commercial house where the large flock is kept, probably during the winter should provide room for passing through with a wheelbarrow. Feed boxes may be situated in the loft or in one end of the pen and provision should be made for keeping track of feed used, eggs laid and other details.

With respect to location, light loam or sandy soil will have the advantage of draining easily and being dryer. Rolling or sloping ground will be the next choice. There should be land close by suitable for growing green stuff, good grass being desirable for the purposes of colony houses and all summer operations. Heavy land that is practically flat should be drained, ordinarily, to be dry and healthful. Avoid low places which will be cold even when sheltered from the wind. The floor of the house should be a foot above the soil and the land should slope to the south or southeast whenever possible. If cold winds prevail it will be desirable to give the chicken house the shelter of a barn or orchard



FARMER'S POULTRY HOUSE

or similar obstruction. Where these do not exist, an artificial windbreak of trees or shrubs should be provided.

Whitewash is a great boon to the chicken breeder. Dabbing the walls with a thin mixture of lime and water does little or no good. Finely crushed lime should be dissolved in hot water; make the mixture as thick as possible; add a little soft soap and some paraffin. This gives a whitewash that will stick to the walls and kill the lice. It should be applied hot after the walls have been carefully swept. Perches and boxes should be removed first and also given a coat. Do this in the morning so that the house and fixtures may be thoroughly dry

by night. Chickens require a good deal of water. A running stream is best but the overflow from a pump or stock watering trough is a good substitute. The water supply must be clean and fresh as well as abundant.

Experience shows that it is not the expensive or heated house that keeps hens healthy. The modern home of Mrs. Egg Producer has plenty of fresh air but no draughts; it contains more fowl to the cubic foot than old styles but has no dampness or bad smells. Wood, glass and cotton are the principal materials required for construction and with a saw and a hammer a handy man can erect a palatial shelter to suit the most fastidious hen.

The "farmers' poultry house" is 16 × 32', is divided into two pens, each 16' square and will accommodate 100 hens. The experimental farm at Ottawa pronounces it satisfactory and it is in common use in every province of the Dominion. It may be built with a single roof or a double roof and a straw loft. For districts where wet weather or humid atmosphere prevails, the straw loft is recommended. It is drier though colder. If a concrete floor is desired, it can be constructed as a slab on the surface of the ground; no foundations are required.

The materials required to construct this building are as follows:—

	Board feet
Studs, 2" x 4" 262¼ lin. feet	175.5
Plates, 2 pcs. 32' x 2" x 4"—64 lin. feet	43
Sills, 2 pcs 32' x 2" x 4" and 2 pcs. 16' x 2" x 4"—96 lin. feet.	65
Rafters, 24 pcs. 10' x 2" x 4"—340 lin. feet	227
Floor (T. & G.), 512 sq. feet (+ 10%)	564
Roof Boards, 680 sq. feet	[illegible]
Shingles, 680 sq. feet; 1 roll building paper,	
Wall Boarding (T. & G.), 800 sq. feet (+ 10%)	880
Ceiling Joist, 17 pcs. 16' x 2" x 4"—272 lin. feet	187
Ceiling Boards, 68 pcs. 32' x 1" x 3"—2,176 lin. feet	384

2 windows, 5' x 5' and frames, cotton and wire mesh.
2 windows, 3½' x 5' and frames, cotton and wire mesh.
4 windows, 3' x 5' and frames, glass and wire mesh.
2 windows, 3' x 3½' and frames, glass only.
2 doors, 2' 9" x 6'.
2 lowered windows, 2' x 2½'.
Paint (3 coats), hardware (hinges, nails, screws, etc.).

For concrete floor:—

5 bbls. cement.
1½ cu. yds. sand.
2¾ cu. yds. gravel.

Make the rough concrete with one bag of cement to six barrows of good unsifted gravel, not too coarse; for the finishing coat use one bag of cement to two barrows of sand.

A breeding house may be of any size, according to number of hens setting or chickens produced, the accommodation being planned for broody hens and young chicks. This must be quite warm, free from draughts or vermin and as free as practicable from disturbance and noise.

A brooder house is a small pen for very young chicks, usually from the incubator. It is supplied with artificial heat and suitable feed. It has openings for the young birds to go outside when the weather is fine and room inside for them to run about when it is cold or wet outside. It will be a portable affair, comparatively light and will be placed in a meadow or grass field where the picking is good and tender.

The "colony house" is larger and also portable. It is suitable for growing or laying fowl and has accommodation for both kinds. It serves as a shelter for foraging parties in grass plots and makes a good centre for a wire fence enclosure, enabling change of ground or "pasture" which is desirable under certain conditions.

The "commercial" house is very similar to the "farmer's" house but is fitted out specially for layers or fattening fowl. A popular size is 20' x 20'; 6 ft. high at the front slanting to 4½ ft. at the back, giving plenty of freedom to 100 birds. Part of the sides will be of wood, part glass and part cotton, giving light strength and good ventilation.

HOUSE FOR SMALL FLOCK

For small flocks of ten to twenty birds kept in a back yard a house 6 feet by 10 feet will be sufficient. Almost any inexpensive lumber of sound, may be used for building this house. Roof, [illegible] sides, house [illegible] made

TO ACCOMMODATE 15 TO 20 HENS

tight and should be covered with some good water-proof [illegible] fabric. Use roofing fabric on the front of the monitor-top---that part of house above south slope of roof—and be sure to lap it well over the fabric on roof to give a weather-proof joint. Fit the roofing snugly around the windows of monitor and face the ends and bottom of these windows with planed lath so that it will overlap the roofing.

The illustration shows the front and east elevation of the house The building is shown on posts a desirable way to build in some locations. When built on posts the house should have a double board floor with tar -paper between boards. If built with a wood floor, give the floor a good coat of some creosote wood-preservative before using it. In many locations it will be well to set the house on a cement foundation, just far enough above ground level to keep out water

This house is made 4½ ft. high in front, 7½ ft. high at monitor—of which about 22 inches is the monitor above the south roof—and is 5 ft. high at rear wall. Low front part of house is 6 x 4 ft., high rear part 6 x 6 ft., floor measure. The door is usually placed in east side as shown, with a window in side wall of

low part in front of door. Door may be placed in west side if more convenient. In other side, opposite the door, is another window. The monitor-top has two windows, each 3 light, 8 x 12-in. glass. These windows are hinged at the top to swing out like an awning. To hold them in position when open or closed, use pieces of strap-iron drilled with nail holes to make an adjustable bracket. Use a screen of one-half inch mesh wire netting on a light frame hinged at top to swing inside of the house back of windows. Side windows also have screens for use when windows are taken out. For hot weather use a screen door of one-half inch mesh wire netting inside the regular door so that solid door may be kept open.

With the exception of the space occupied by the studs, plates and rafters, the "hen door" and a board 12 inches high from bottom of sill the front of the house is always open, being enclosed only by one-fourth inch mesh wire cloth. South slope of roof has a generous overhang to carry the drip of rain or snow away from the wire front.

RULES FOR SELECTING LAYERS

1. Hens that molt late and quickly are the best layers; that is, hens that molt in October and November are better layers than those that molt in August and September.

2. In such breeds as the Rocks, Wyandottes, Rhode Island Reds, and Leghorns, individual hens found with pale colored shanks during the months of October and November are better layers than those with bright and yellow shanks. This applies only to breeds having yellow shanks and for these two months named.

3. The above principle applies also to the color of ear lobes in breeds having white or creamy white lobes. The Rocks, Wyandottes, Orpingtons, and other breeds of the American, English and Asiatic classes have red ear lobes. Hence this indication for these breeds is valuable, and experience has shown that Leghorn varieties with white ear lobes in the fall are better layers than those with yellow or cream colored ear lobes.

4. The hen that starts to lay in the fall continues to be a good producer all winter.

5. Hens over three years old having long spurs are poor layers. The singing hen with a bright red comb either is laying or soon will be laying. A quiet and lazy bird having a pale colored comb is not a good layer. The laying hen is usually the last on the roost at night and the first off in the morning, has a full crop, and is a heavy eater. She is a better producer than the hen that spends the major portion of her time on the roost or humped up in the corner of the pen, or basking in the sun all day.

6. Closely worn toenails indicate activity. They are commonly found on the hard-working, industrious hen, and indicate good production.

NUMBER OF MALES REQUIRED

Varieties of the Mediterranean or egg-laying class, such as Leghorns, Anconas, Minorcas and Campines, are usually mated one male to fifteen females. In the American or general-purpose class—Plymouth Rocks, Wyandottes and Rhode Island Reds—it is customary to mate one male to about ten females. In the Asiatic, or meat class—Cochins, Brahmas and Langshans—it is advisable to use one male to six or eight females.

These figures are merely approximate and are intended to apply to single flocks, that is, pens where but one male is to be used. In larger flocks the ratio

of males to females may be greatly reduced, since there is less likelihood of the males having favorites. In a flock of fifteen Leghorns there may be two or three hens uncongenial to the male, consequently the fertility of the eggs from such a pen will run about eighty-five per cent.

In a flock of thirty-five hens to two males a certain amount of rivalry exists, which tends to reduce favoritism and thereby increase fertility. In a flock of sixty females to three males there is still greater rivalry, while in a unit of 500 hens or pullets to about twenty cockerels little if any discrimination is found, and the fertility of the eggs should run ninety-five per cent. or better. With turkeys the rule is one male to 10 females, the male not to be over two years old. Ducks, one drake not over two years of age, with 5 or 7 ducks, if birds are in confinement; if running at large, 10 or 12. Geese, one gander, from 2 to 7 years of age, with 1 to 4 geese.

Eggs should prove fertile within three or four days. It would be a good plan to allow a week before using the eggs for hatching. The influence of fertilization will extend for several weeks after the male is removed from the pen.

HASTENING THE MOLT

The proper time for the hens to grow their new coat of feathers is in the summer time when the danger of colds from exposure is reduced to the minimum. Late molting is slow molting, often prolonged till cold weather, which means that laying will be late, and the tardy hen will not pay for her board. Late hatched birds will molt late; too early hatched birds will molt late and be no more profitable for winter laying then hens, as a general rule the older the hen the later the molt. To secure early molting and early laying then we must have hens which were hatched in March, April, or early May of the previous year. Early in July the rations should be reduced until the hens are getting about half what they eat in the winter time. On the farm, feeding is not usually continued after the range is good. Whether or not this is conducive to an early molt depends on whether the birds have access to cribs and granaries. If they go to roost with full crops it is better to confine them for a part of each day until the feathers begin to loosen and drop out well. Two weeks of light rations will start any hen of a profitable laying age toward molting. When the new feathers begin to come the birds should be fed heavily on a rich nitrogenous ration, say sunflower seed. The molting process is always a drain on the system, and should not be delayed till cold weather; not only because it means delayed laying, but also because there is more danger to the hen. Where eggs are the object of the poultry plant, hens which have not finished molting by October 1st should be disposed of.

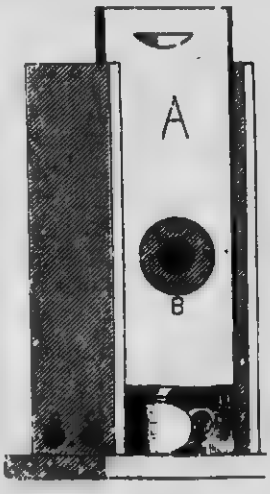
KEEPING EGGS FOR HATCHING

The advice is always given—to set eggs as soon as possible after they are laid. It has been found that eggs set the same day they are laid will hatch about eighteen hours earlier than those kept two weeks. Eggs kept over one week lose hatching power, yet tests have been conducted at experiment stations which show that eggs can be kept under proper conditions for a month and still hatch well.

If eggs are held at too low a temperature, the chilling weakens their vitality. If they are kept too warm, premature development of the life germ begins. The best temperature appears to be about fifty degrees Fahrenheit. Eggs evaporate quickly if kept in a dry room, especially if they are stored in the way of direct currents of air; therefore, they should be held in a moderately moist atmosphere, yet not damp enough to create molds, and away from drafts.

CANDLING EGGS

In view of the fact that new legislation has been enacted regulating the grading of eggs both for domestic commerce, and for export, egg testing will require more attention than heretofore. Candling is the accepted method of testing and with simple apparatus good results can be obtained. The egg being semi-transparent, its condition can be pretty accurately ascertained by holding it before a light aperture in a darkened room. A kerosene lamp, a gas jet or a 10 to 16 candle, incandescent bulb will be sufficient. In a new-laid or "fresh" egg, the yolk should be spotless, the albumen strong (not watery) and the air space at the big end not larger than a ten cent piece. As the egg gets older and staler, the contents shrink and the air space grows larger. A dark shadow appears across the yolk that gradually becomes denser and finally an opaque spot. The shadowed egg may be used for cooking but the spotted egg is useless. The air space becomes broken and yolk and albumen mix with shaking. Cardboard boxes for use with lamps or electric lights can be had free, on application to the poultry division, Live Stock Branch Ottawa, similar to accompanying illustration.



TWO FORMS OF EGG TESTERS

SOFT-SHELLED EGGS

Complaints of soft-shelled eggs seem to be frequent, which may be attributed to over-feeding as a general rule, for poultry-keepers forget that during the summer months there is an abundance of insect food, such as worms, grubs, etc., so that the birds do not require so much feeding. When over-fed, the fatted

organs do not permit of the egg being shelled properly. It, however, often happens that hens cannot obtain sufficient lime salts from the food partaken of, and grit, shell, etc., should be supplied, whilst it must not be overlooked that grass contains lime, and confined birds if allowed to run in fields will soon receive benefit. Wheat and oats both contain a goodly percentage of lime. Laying hens must daily secure their lime supply from various sources. Another cause often overlooked is that hens of a very prolific strain produce their eggs too rapidly for Nature to keep pace with them. The eggs do not remain long enough in the oviduct to receive their covering of shell. Weakly or debilitated hens will be improved by an iron tonic and change of ground. Again, this trouble is sometimes the result of allowing too many male birds to run with laying hens, and when possible it is wise to separate the sexes and keep the male bird away for a time, or at least until next breeding season. Fright from dog will cause shell-less eggs, but lack of shell-forming material and overfeeding is the most general cause.

COOP IN POSITION

COOP FOR BROODY HENS.

There are many methods adopted to break up broody hens, some of them cruel. The device illustrated has been found satisfactory and does not injure the bird. It is a coop or swinging cage easily made with lathes and nails. The idea in suspending it is to keep it in almost continual motion by the movements of the hen. The motion may be accelerated by having the lengths of rope which attach the coop to the branch of a tree or to a beam of different lengths. This causes the coop to move irregularly when the bird moves. Regular feeding and watering will start the hen laying again.

DIET FOR FERTILE EGGS

The surest way to have eggs strong in fertility is by allowing the hens a free run—or as free run as possible—as soon as the snow is off the ground. There is really no best dish to produce strong germs in eggs laid by hens, which have been artificially fed and treated during winter, and perhaps gently stimulated to lay eggs, during that period. Try the following: For morning ration, give wheat, thrown in litter on the floors of house and so induce hens to exercise in searching for it. At noon, give a light feed of oats, which should give place three times per week to a ration of cut green bone in proportion of one pound to every fifteen hens. In the afternoon, give a mash, in quantity of two ounces to each fowl, and composed of two parts shorts, one part ground oats, one part cornmeal, or ground buckwheat. Or the mash may be made of such ground grains as are

conveniently to be had mixed with boiled turnips, or other roots. Keep the fowls busy searching for their grain. Have grit, oyster shells, pure water and roots before the fowls all the time. The germs of eggs from hens which have been confined to winter quarters and which have laid well are usually weak until the hens have had a run out.

CLEANING DIRTY EGGS

It is a great mistake to wash dirty eggs. The appearance may be improved and a clean shell is more saleable than a soiled one but the egg will not keep fresh once the natural coating is removed. An egg shell has pores in it and when these are opened by washing air can pass in and out and make the contents stale in a short time. A shell that is securely sealed will keep the egg sweet a long time, like canned fruit. How long will a can of fruit last when the air can get in it? The same applies to an egg. Clean your eggs if you will, but do it right by closing the pores afterwards with vaseline, paraffine or some oily substance.

REARING INCUBATOR CHICKENS

Do not feed newly hatched chicks for 24 or 26 hours, depending upon the vitality of the youngsters. Their first food should be stale bread crumbs mixed with a third of hard boiled eggs chopped fine and fed in small quantity from time to time. Vary this with stale bread soaked in sweet or skim milk and squeeze dry. After three days give granulated oatmeal. Feed a little at a time and avoid overfeeding. Give no water for three days and then very little. Overfeeding and too much water are apt to bring on dysentery. Continue this treatment for eight or ten days, when crushed corn in small quantities may be fed. Give whole wheat after twelve or fourteen days. After the chicks have got firmly on their legs, a cheap mash may be made of table or kitchen scraps, etc., and fed in a crumbly condition. All food should be fed in such quantity that it will be eaten up clean. Leave no food about to turn sour. Milk, sweet or skimmed, is one of the best foods and is very much relished. At first, feed a little and often to the young chicks. Afterwards, feed once every four hours during the day until so old that they can run in the fields. But at all times feed regularly. Some persons have great success by feeding ground wheat from the first. A run from brooder or coop on the grass is very beneficial. When grain is fed, give fine grit. Let the latter be before the chicks all the time.

Continue the crumbly mash, which after 15 or 20 days may contain finely cut pieces of liver. Or the latter may be fed alone, but judiciously. As the chicks grow older, the house waste, barring salt and fat food, may be added to the mash. Hard grain may also be given. Crushed corn will be found to be much relished and of great benefit. The rations need not be expensive or composed of all the constituents named. With a grass run and such treatment the chicks will make famous development, and ought to weigh six pounds per pair at the end of three months.

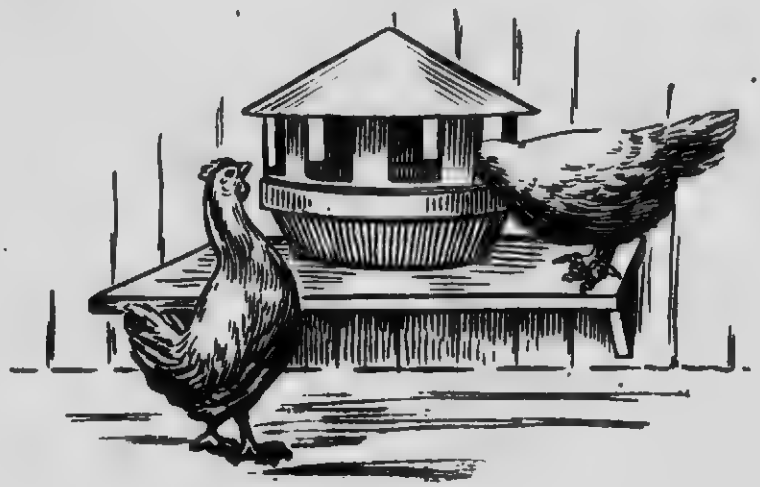
WINTER EGGS

The essential elements in the production of winter eggs are, hardy, vigorous, pure-bred pullets that have reached maturity before the cold fall weather sets in; proper housing accommodation and suitable feed. Keep birds separate from old stock during summer; place in winter quarters not later than the middle of

October. Put those of same size and age in same pen; provide an average of from four to six square feet of floor space for each bird. First, the house must be dry, outside and in; then it must be well ventilated and lighted. The provision of a straw loft or the use of cotton front or open front houses are highly recommended for removing dampness. Plenty of sunshine and dry dust bath facilities will be most conducive to the health and comfort and profit of the hen. Heat is not essential for hens as with other farm animals although extreme cold is objectionable. Cleanliness is a first consideration in the hennery. Plenty of simple, home-grown feed and natural exercise will do the rest. Hard grains and table scraps all have their place, and variety is advisable. Vegetable protein is essential. Plenty of grit and shell must be available at all times. Observe the happy medium in quantity of feed given. Of course the health of the flock will not be overlooked.

WATER PANS.

In the construction of a water pan for poultry, some provision should be made to keep out dust and litter. The forms shown in the illustration permits fowls to drink from different sides at one time, and presents the smallest possible space for filth to enter. The round cone-shaped top prevents the fowls roosting upon it. It may be fixed on a platform high enough to prevent the litter being rescratched into it.



WATER PAN IN USE

LICE AND MITES

It is estimated that more chickens die from lice infection than from any other single cause. Few people treat fowl for this pest until the vermin become very numerous. Very young chicks, brooded by the hen are first-class victims and early martyrs. It is always safe to suspect lice and look for signs of their presence. The "red" mite is the most troublesome of all. They are not red until after they are filled with blood. The natural color is grey. The young mites are white and have only six legs. They cast their skins several times and during the process develop two extra legs. The first indication of their presence often is a white speck of powder on the perches—the residue of a cast-off skin. Their

first food may be filth or decayed wood. They can live for months and reproduce without animal food. They usually attack the birds at night but may be found on laying hens and have been known to drive broody hens from their nests. They pierce the skin with their needle-like jaws and after sucking their fill of blood retire to the cracks in the building, nests, roosts and cleats being favorite hiding places. They will bite man or farm animals but will not stay long on them. Warm weather is their swarming time.

REMEDY:—The first thing to do is to clean the chicken house thoroughly. Move everything that is movable. Clean away every particle of droppings and dirt, straw, nesting, etc., and burn it. Next scrub down the walls with brush or broom and spray or paint everything with a strong disinfectant. Half measures are no good. Every crevice and every inch of surface must be reached. And this should be repeated in a few days to destroy the mites that batch after the first application.

Several preparations are recommended for washing with. Dissolve one pound and a half of concentrated lye in as small a quantity of water as possible two or three hours before using. Put three quarts of raw linseed oil into a five gallon stone crock and pour in the lye slowly, stirring meanwhile. Stir until a smooth liquid soap is produced. Ther add two gallons of crude carbolic acid or commercial creosol, stir constantly until the fluid is a clear, dark brown. Use when cold in the proportion of three tablespoonfuls to a gallon of water.

A strong solution of Zenoleum or any other creolin preparation may be used where it can be obtained. Coal oil will kill vermin but it evaporates too quickly to be lasting. Crude carbolic acid one part, to coal oil four parts, makes a good preparation to apply with a brush. Use it liberally. Flood all cracks.

Individual "dipping" of the hens will prove effective in giving relief and making the work more thorough. Sheep dip may be used. A tobacco dip can be made with one pound to a wash boiler of water. These dips are only for warm weather and a sun bath should follow. In cold weatehr blue ointment rubbed under the wings, the back of the neck and in the fluff will be effective. Dusting with insect powder is another winter remedy. Shake well into the feathers holding the chicks by the legs. For small flocks insect powder liberally applied should prove effective and not too expensive, combined with a "clean-up."

SPROUTING OATS FOR HENS.

When green feed becomes scarce in late winter, the need for it in the hen's ration is greatest. There are many cheaper kinds of feeds, such as roots and cabbage, but none that is to be had everywhere as are sprouted oats. Though many poultrymen have tried the method and given it up because of the bother, yet, properly systematized, the time required to prepare the oats is relatively little.

Provide a rack with enough trays to keep a continuous supply. Four or more trays, each holding a half bushel of oats, are best. Put the oats to soak in a pail of warm water and let stand overnight. Next day, drain them and spread in the trays about one inch deep. Keep the rack of trays in a warm place Behind the furnace in a cellar is a good location if it isn't too dark. Sprinkle the trays with warm water daily.

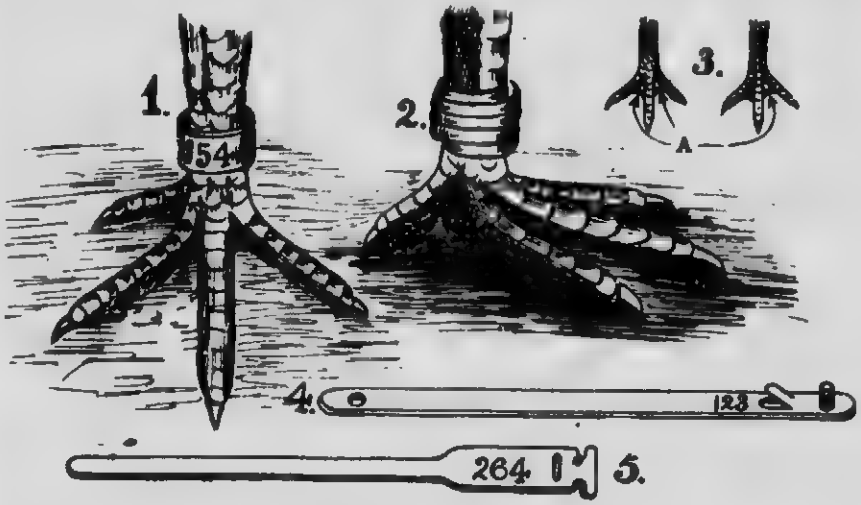
To prevent mold, treat the oats with formalin as follows: One pint of formalin should be sprinkled over thirty bushels of oats. Mix them thoroughly in the pile and then cover with bags or a blanket and leave for twelve hours. Remove the covering and stir the pile at intervals for two days till the oats are perfectly dry. Then place in clean bin or in bags that have been sprayed with formalin

When the oat sprouts are about three inches long the mass is ready to use. Give the hens as big a piece as they will clean up in twenty minutes or a half hour. It is a good plan to alternate feeds, giving oats one day and roots or cabbage the next. If you use green bone or meat, alternate days with a feed of that.

MARKING CHICKENS.

Those who keep a very close tab on their layers through the use of the trap rest need to have the birds marked as shown at 1. A band made of some metal that will bend easily is put on the leg, and on the band is a number. The band is made in several different styles, two of which are shown at 4 and 5.

When the object is merely to distinguish between birds of different ages, where, in a small flock, pullets, year-olds and two-year-olds are allowed to run together, the band shown at 2 may be used. This is made of celluloid, and twists



ATTACHMENT OF LEG BANDS

on to the leg. These bands are sold in different colors, and blue could be used for the two-year-old birds, red for the yearlings, and so on; the color is immaterial providing bands of the same color are put on birds of the same age.

At 3 is shown a way of marking chickens. It is used by breeders of pedigree stock to distinguish birds from different matings, and could also be used by the ordinary breeds, though the method is not as plain as using the colored bands. When the chicks are moved to the brooder, punch marks as shown at the letter A are made, and by this method sixteen different matings can be identified. The punching must be done on the baby chicks.

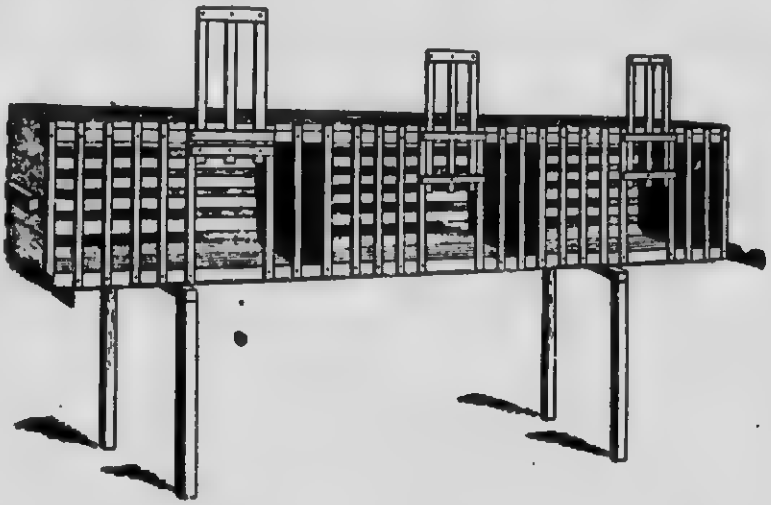
THE USE OF HEN MANURE

Hen manure is rich in nitrogen, and quite deficient in both potash and phosphoric acid. The nitrogen is in such shape that unless the manure is kept dry a good share of the ammonia will be lost. The best way is to keep the manure under the perches well dusted with land plaster, road dust, sifted coal ashes, or

some similar drier. Then scrape it off the boards frequently and store it in boxes or barrels under cover in a dry place. If kept in this way the Spring will find it in dry, hard chunks or lumps, without much loss of ammonia. These chunks must be crushed or ground fine in order to make it spread readily and be most effective. These chunks can be crushed by putting them on a hard floor and smashing them with a heavy spade or club. If there is a large amount of the manure, it will pay to run these chunks through a mill, and grind the manure fine. This fine manure can be used alone like any other fertilizer, or to make it more effective it can be mixed with chemicals.

FATTENING CHICKENS

There is ordinarily from three to seven cents a pound difference in the price paid for well-fleshed or fattened birds to that paid for birds just off the range or fields. Not only does the feeder make upon the gain made while the chicken is being fattened but the original weight is increased in value by the improvement in quality. Good, thrifty cockerels of such breeds as Rocks, Orpingtons, Wyandottes or Rhode Island Reds will make economical gains. Best results will be obtained with birds from three to four months of age when they will have a weight of three and a half to four pounds.



A fattening crate may be made 7 feet 6 inches long, 18 to 20 inches high and 18 inches wide. This is divided into three compartments each holding from four to five birds. The ends and partitions are close boards, the rest is made of slats. Professor W. R. Graham, of the Ontario Agricultural College, has found the best ration to be composed of two parts finely ground oats, two parts finely ground buckwheat and one of finely ground corn. To this is added sufficient sour milk to make a batter or ordinarily about two to two and a half pounds milk to one pound of grain. Keep the crates in a secluded place to avoid any disturbance of birds. Avoid overfeeding as appetites must be kept keen to secure gains in weight.

PRESERVING EGGS

In the first place, eggs must be quite fresh. In the second place they should be infertile, in other words, gathered a week or so after the roosters have been

removed from the flock. As for preservative measures, the following have been proved satisfactory and are recognized as among the best.

Lime water made in the proportions of 2 pounds of lime to 5 gallons of water is generally recommended. It is important, however, that the water take into solution as much lime as it is capable of holding. A quantity of fine salt in proportions of about 1 pint to the above is also frequently added, although some authorities do not approve of it. The mixture should be kept well stirred for a few hours, and then allowed to settle. The supernatant liquid is then drawn off, and poured over the eggs. In order that the solution may be kept saturated and of uniform strength throughout, it is customary to add a little lime from time to time, or better, to keep a cloth covered with lime just touching the surface.

In the case of lime-packed eggs, it is essential that the eggs should be kept completely immersed throughout the entire period. Further, as exposure to the air tends to precipitate the lime (as carbonate), and thus to weaken the solution, the vessel containing the eggs should be kept covered. The air may be excluded by a covering of sweet oil, or by sacking upon which a paste of lime is spread. If, after a time, there is any noticeable precipitation of the lime, the lime-water should be drawn or siphoned off and replaced with a further quantity newly prepared.

Water-glass (sodium silicate) has been extensively experimented with, using solutions varying from 2 per cent. to 10 per cent. Some authorities declare that solutions of 5 per cent. (5 pounds sodium silicate in 10 gallons of water) have given better results than stronger solutions. The water should first be boiled in order to destroy all vegetable or animal substance contained therein. The two substances are then thoroughly mixed, and the solution allowed to stand until it becomes quite cold before using. Water glass can be obtained from any druggist and is not expensive—possibly costing slightly more than limewater, however.

For either of the above methods, any receptacle that is impervious to, and does not corrode in, water is suitable for holding the eggs. Glazed earthenware crocks, galvanized tubs or buckets, or wooden tubs or kegs are most frequently used. In the case of wooden receptacles, it is desirable to let them stand filled with water for several days, and then to scald them and cleanse them thoroughly before using. For home consumption it is best to have a small number of small containers holding not more than five or six dozen each. Covers should be placed over all containers and these, when filled, should be stored in a cool, dry place in the cellar.

PREPARING FOR MARKET

All poultry before being killed should be fasted for at least 24 hours but given water to drink. This avoids decomposition of food in the digestive tract and tainting of the flesh. Killing is done by bleeding in the neck or through the mouth. Hang the bird up by the feet with a small rope or cord. Take a sharp knife with a blade about three inches long. Catch the bird's head with thumb and fore-finger just at the juncture of the neck and head or at the ear lobes and with the fore finger in the chicken's mouth. Insert the knife about the full length of blade and cut across the back of the throat to sever the veins. Next insert the point of blade in roof of mouth and push backward to pierce the brain.

Plucking is most easily done while the body is warm. Do not draw the entrails or scald the birds. Let the birds cool off, then draw the feet up under the breast and put the head under one of the wings. Tie them up plump to

keep them in good shape. Before packing poultry should be thoroughly dry and cold. If packed with the animal heat in they are almost sure to spoil. Line the cases with clean paper and pack closely to prevent shaking about while in transit. Get uniform weights and quality in each case.

EGG EATING

Egg eating is a vice that is not easily cured. Various plans of curing this vice have been tried with more or less success. Eggs which are laid on the floor or in other exposed places are apt to be broken, and these attract the hen. The only practical way of solving this difficulty is to have nests that will be so convenient and comfortable that the hens will always seek the nest when they desire to lay. Often it is the mere lack of oyster shells, or some other lime material, that prompts the hen to break her egg. So first be sure that the egg-eater gets plenty of shell-forming material. It is claimed to be a good plan to place artificial eggs in the nest and about the house so that the hens may pick at them and get the idea that they are no longer able to break egg shells. It is well, when doing this, to pare off the points of the fowls' beaks until they are quite tender, so that to peck an egg would cause pain. It is also recommended to blow out the contents of a few eggs through a small hole in the shell and fill the space with a paste consisting of mustard, capsicum, aloes or other disagreeable compounds, and leave these where the hens will find them. Another plan is to use darkened nests, so arranged that the hens will have to walk along a passage against the wall and back along another passage before they can enter a nest. Perhaps the only safe and sure remedy, apart from doing away with the birds that have contracted the habit of egg-eating, is to use a nest so arranged with a hole in the bottom that when an egg is laid it will roll into a safe receptacle. A handy man may be able to devise such a nest or one of the patented nests that are on the market may be secured.

BUMBLE FOOT

The affection known as bumble-foot consists of a swelling on the ball of the foot, which either is in the form of a corn or of an abscess. Sharp gravel, or a cement or stone floor will induce the trouble. In the former, when the foot is cut with the gravel (glass or sharp stones will have the same effect), an abscess generally results. In the latter it is usually a corn. With both there is a considerable amount of fever from the inflammation set up. If the abscess is only a small one, and there is not much matter in it, the best thing will be to daily apply lunar caustic in the usual way. But if the swelling is large, with an evident gathering of pus, an incision will have to be made. After all the matter has been squeezed out, and it must all be got out to effect a cure, the place should be bathed with warm water once or twice a day, and two days after touched with the caustic. Should it gather again, the effect of a poultice may be tried.

ROUP IN FOWLS

Roup attacks the head and throat and is generally the result of draughty roosts, dirty quarters, tainted water for drinking and sour, badly-kept food. The first indication is a wheeze in the throat and sneezing. Five drops of tincture of aconite in a quart of drinking water for a few days will usually effect a cure in the early stages. If the face and head have become swollen and there is a discharge from the nostrils a serious form of roup exists. The disease is very con-

tagious, and if you don't take away a bird affected you will soon have them all "smitten." If the bird attacked is valuable, you can try to cure it, but if it is not worth a good deal of expense and trouble, wring its neck and burn the carcass. Some people who know their business will never breed from a fowl which has had roup.

LIVER COMPLAINT IN POULTRY

The principal cause which gives rise to liver complaint is wrong feeding or over-feeding, which amounts to the same thing. It begins in poultry, as in human beings, with indigestion. The food is either in excess of what the bird can digest, or else it is of the wrong quality, and in either case the liver is not able to discharge its functions. The blood becomes loaded with impurities, and sooner or later the bird will become a hopeless wreck and die. By unsuitable food, reference is made particularly to food of a starch nature, such as corn meal and rice. If poultry keepers would use oats, barley and wheat, more particularly oats, and give up altogether the use of corn and rice, there would be far fewer cases than there are of liver complaint.

There is first a darkening of the comb; in some parts of the country liver complaint is known as black comb from the purple appearance, turning almost to black, which birds present as the disease progresses. General debility, moping, setting up of the back and drooping of the tail, are other symptoms; so, too, is diarrhœa, the appearance of which indicates the presence of undigested food in the intestines, which sets up irritation, and so causes this additional trouble. Whenever a fowl is seen to be dark in the comb and to have diarrhœa, it is perfectly certain that death is not far off unless prompt measures be taken.

The thing to do is to put the bird on starvation diet for a few days to enable the system to rest and recoup itself, and also to give time for the fatty degeneration of the tissues to be remedied. Most birds which suffer from liver complaint are more or less fatty in their internals, and a few days' fast will tend towards the absorption of this, because the system, not having ordinary food, will have to live on its own tissues. By way of medicine, give some liver powder or Epsom salts or some other simple remedy in a little barley meal, specially mixed up into a paste, which they will take usually when they are hungry; give also some iron tonic in the drinking water.

TUBERCULOSIS IN FOWL

Tuberculosis in fowl may affect the liver, spleen, intestines, mesentery, lungs, bones, ovaries, kidneys, etc. It is difficult to detect the disease in its early stages. Emaciation is the chief symptom. The birds may eat more than healthy fowl but usually will continue to lose flesh constantly until they are little more than skin and bone. In exceptional cases they may remain fat but become mopy and inactive. Unfeathered parts will grow pale; feathers lose lustre. When in the joints or bones lameness ensues. Laying will be reduced to a minimum. The liver is most commonly affected. The tubercles appear as pale yellow spots or lumps on the surface and throughout the organ which frequently is found to be greatly enlarged. The spleen will be similarly affected. On the walls of the intestines hard lumps will be found ranging in size from a pea to a chestnut. The droppings from such a bird are a danger to the entire flock. The lungs are less frequently attacked. Here little, hard, yellow lumps will interfere with the action of the organ and gradually will destroy the tissue. The disease is usually introduced into a flock by an affected bird purchased

before symptoms appeared, although any fowl in any flock may become tubercular through individual defect or weakness. It is extremely difficult to eradicate the disease once it becomes established and killing is the only cure. Their pens and ground and everything about the premises must be cleansed and disinfected. Lime and carbolic acid are recommended for this purpose.

SCALY LEGS

Scaly legs in poultry is caused by the presence of mites that multiply and work beneath the scales on the feet and legs. A whitish crust or powdery substance forms beneath the scales and raises them up. The disease is strictly contagious, and if not checked extends up the leg and also along the toes involving the joints and causing exhaustion of the bird. Treatment for the disease consists in isolating the affected birds in clean quarters where they must be treated. The house which they have occupied should be thoroughly cleansed. The roosts and all wood-work should be scalded with boiling water and sprayed with hot lime wash. The treatment of the affected birds is to soak the feet and legs in warm soapy water until the loose scales may be removed without causing bleeding. The legs should then be treated daily with coal oil mixed with an equal bulk of linseed oil or vaseline; or a mixture of one part carbolic acid and ten parts of oil or vaseline.

INTESTINAL PARASITES (WORMS)

Dr. A. B. Wickware, assistant pathologist at the Experimental farm, Ottawa, estimates that the annual, preventable loss in connection with poultry raising amounts to five million dollars, or one-tenth of the total production; and that parasites and infectious diseases are largely responsible for this.

"Sanitation" must be the watchword in combatting the ills that (poultry) flesh is heir to.

Intestinal parasites are divided into three classes: (1) tapeworms; (2) round worms; (3) flukes, or leaf-like worms.

The tapeworm varies in length and tapers from the head to the tail, the various segments being also funnel-shaped. Worms, too small to be seen with the naked eye, frequently exist in the first portion of the small intestine while larger ones up to five inches long, will be found in the lower end of the small bowel. The tapeworm is of a white or creamy color and attaches itself to the mucous membrane by means of small hooks situated in the head.

Symptoms:—Moderate infection is indicated by ravenous appetite and excessive desire for water. Heavy infection may result in fowl refusing to eat. There will be reduction in egg yield, unthriftiness, wasting of flesh, emaciation and weakness. Yellowish diarrhœa is sometimes observed in which will be communicable germs that spread the infection. The birds will appear bloodless; combs and wattles will become faint pink or white. In Leghorns the combs may shrink; feathers will lose glossy appearance; wings will droop and birds will mope around separating from others. Eyes may stare and partial paralysis of legs may take place. These symptoms of parasitic invasion should be verified by the finding of mature worms. This can best be done by slitting open the bowel under w[illegible]r in a pan. Wash out bowel carefully when parasites will be seen adhering to inner lining.

The symptoms indicative of round worms are practically identical with the above. General debility, rather than mortality, results from infestation. "Flukes" are more rare and are found in the gullet and intestines.

Remedy:—Give one or two teaspoonfuls of turpentine to each affected bird. The dose may be placed directly in the crop by means of a small rubber tube one-quarter inch in diameter. Turpentine, also, can be given by means of a medicine or fountain pen dropper. This method is very irritating to the fowl though the irritation will be greatly reduced by thoroughly mixing an equal amount of olive oil with the turpentine. Do not allow the dose to get into the windpipe. Fowl should be fasted for twenty-four hours and given a teaspoonful each of Epsom salts in a mash twelve hours before dosing. Another laxative mash may be given four hours after giving the turpentine.

BREEDS OF GEESE.

The leading market breeds of geese are the Toulouse, Embden, Wild or Canadian, African, Brown Chinese and White Chinese. The first two are probably the most popular. The Toulouse, the African and the Canadian are gray in color; the Embden and White Chinese have white plumage; the other breed is brown.

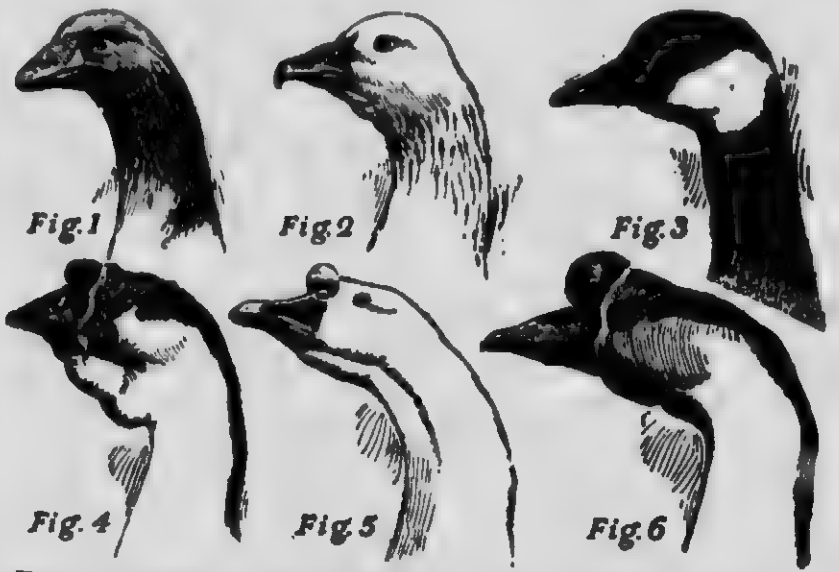


Fig. 1, Toulouse. Fig. 2, Embden. Fig. 3, Canadian. Fig. 4, African. Fig. 5, White Chinese. Fig. 6, Brown Chinese

An adult Toulouse gander weighs twenty-six pounds, the adult goose twenty pounds; the young gander twenty, and the young goose sixteen pounds. An adult Embden gander weighs twenty pounds; adult goose eighteen; young goose sixteen pounds. The weights of Wild or Canadian adult gander, adult goose, young gander and young goose, are twelve, ten, ten and eight pounds, respectively. The adult birds of the African breed have the same weight as the Embden adult birds, but the African young gander and young goose weigh sixteen and fourteen pounds, respectively. The African and Chinese breeds show distinctive knobs or protuberances on their heads, while the heads of the other breeds are plain. Toulouse geese have massive bodies of medium length, broad and very deep, almost touching the ground.

Embden geese are considered only fair layers, the egg yield varying greatly among individuals

Yeu old geese are not mature enough for breeders. The females lay fewer eggs of smaller size, and usually mo of them are infertile than is generally the case with females two or three ye s old.

CARE OF GEESE

It is said that an extremely nervous person is not likely to make a good handler of geese, as they need a very quiet, careful attendant. Still, once their habits are established, they call for only a minimum of care, since they are pre eminently grazing animals. They do best on moist, rich land, where the grazed areas will soon be re-covered with tender gra s. If room is scanty, green feed, like rape, oats, etc., must be supplied. Separate broods are likely to form clans of their own, and divide the area to be pastured, each keeping the same portion as if by perpetual contract. It is said that where many hundreds of geese are kept on large common lands this still holds true, each having its own grazing ground. Only light shelter is needed in very cold weather, and as only a little grain is safe there is probably no other domestic animal that can be handled on so little capital and with so little steady outlay, provided that pasturage is available. It is not necessary to have large streams or ponds for them, though these are very desirable. A half barrel, sunk in the ground, seems to supply their needs very well. Fences for geese need not be very high, but they must be tight at the bottom, as they are keen to find an opening below.

SEX IN GEESE

It is not easy to distinguish the ganders from the geese and vice versa, especially in the Embden and Toulouse varieties. The male bird in most cases is larger than the female. The call of the gander is loud, shrill and long, that of the goose much less so. Again, the head of the goose is smaller, the neck thin ner and she is deeper in body. A method sometimes practised is to separate a flock by driving part on each side of a fence or small building, when the ganders should be distinguished by their calls. During the breeding season the gander is usually inclined to be vicious and will fearlessly defend the goose when she is sitting.

BREEDS OF DUCKS

Though there are about a dozen recognized varieties of ducks there are only four of these that are kept in any considerable numbers. The Pekin is the most extensively bred and is probably as good an all-around market duck as there is They are, however, timid, and liable to get panic stricken when raised in large numbers. As to laying qualities, the Pekins are out-classed only by the Indian Runner. It is a common thing for a Pekin duck to lay from 100 to 125 eggs in a single season.

Next in popularity to the Pekin is the White Aylesbury. These are most extensively bred in England. They are a little larger in size than the Pekins but the carriage of the body is a little more horizontal, the Pekin always stand ing more erect. This difference in carriage is caused by the legs of the Peki being set further back, thus compelling them to walk in a more upright positi The beak of the Aylesbury is a light pinkish color, which fades somewhat as they advance in years. The beak of the Pekin is a bright orange Both birds havin the same white plumage and orange legs, confusion sometimes follows. There

are two distinct features to guide us in detecting the difference between the two classes, carriage of the body and color of the beak.

Next in popularity comes the Colored Rouen. The principal objection to them is that their feathers are colored which to a certain extent puts them in third rank in the open market. Feathers are a source of great profit to dressers who handle them and as white feathers always command the higher price, it will be seen why any colored duck is at a disadvantage in the open market. Aside from the color in plumage there is a little difference in carriage and general conformation from the Aylesbury. The claim is pretty well founded that the Rouen duck is closely related to the wild Mallard. Its plumage alone makes good this claim. Standard weight is the same as that of the Aylesbury.

Last, but not by any means least, is the Indian Runner. It holds the same high rank in the duck family that the Leghorn hen enjoys in the different poultry families -the heavy layers of the Twentieth Century.

MARKS OF FRESHNESS IN EGGS

Some experience is necessary before new laid eggs can be told with any certainty from stale ones. The new laid egg has a chalk-like appearance with the porous formation of the shell very evident. The stale egg has lost the chalk like and porous appearance of the shell and instead has a distinctly smooth-like appearance, and if very stale a shiny shell. New laid eggs, if placed in water, fall heavily to the bottom of the vessel; stale eggs float to a greater or less extent, according to age, while the decidedly stale ones will come to the top.

JUDGING EGGS BY COLOR OF YOLK

The substance which contributes color to the yolk of the egg is iron, just as it is iron which gives color to the blood, and there seems to be little doubt that the iron compound in the yolk of the egg is of a similar nature to that of the blood. It is easily assimilated, and eggs are regarded as a suitable food for the anæmic person, as they present a concentrated and generally easily digested form of nutriment rich in iron. The iron compound of the egg has, in fact, been termed a "hæmatagen," because it is probable that from it the blood of the chick is derived. The amount of iron in the yolk of an egg would appear to increase with the intensity of its color, and there can be little doubt that the maximum is reached in the richly colored yolk of the egg produced by a fowl existing in healthy surroundings, for then its processes of nutrition would be working under very favorable conditions. As an article of diet, therefore, the egg should be judged, not by the color of its shell, but of the yolk, which should be of a rich reddish rather than of a pale yellow color.

TESTING FERTILITY OF EGGS

The only way to correctly ascertain whether eggs are fertilized or not is to place them under hens or in an incubator and after six or seven days to test them by means of an egg tester. The non-fertilized eggs are quite clear and are easily distinguished. The strong germs of the fertile eggs can also be clearly seen. The germs present the appearance of little black spots with veins radiating from them. But the germs of fertile eggs are not all strong. Some germs are weak and die at different periods during the twenty-one days of incubation. A dead germ at the seventh or eighth day would present a cloudy appearance, or a dark brown spot of larger size than the fertile germ—with a red ring around it.

BEES

STARTING WITH BEES

One or two colonies are enough for the beginner the first year. They may be bought complete with the hives in the spring or swarms may be obtained in June or early July. The first outlay need not exceed twenty dollars after which the bees should pay their way. Look for a strong colony, that is one with plenty of bees and brood in different stages of development. It is best to make the purchases near home to lessen risk of loss in transportation and to be sure that they are free from disease. A colony may be moved more safely in April or May than in the height of summer. Start with the Langstroth hive which has standard size of frames, 17 5-8 inches long and 9 1-8 inches deep. Hives wide enough to take either eight or ten frames are best for the beginner.

RACES OF BEES

Black bees were first introduced into North America from Europe about three hundred years ago, while the Italians are more recent arrivals. There is little difference in size between the two races, the distinction being in the color of the abdomen. The Italians have three yellow bands edged with black. In Nova Scotia and the St. Lawrence gulf region, the blacks are preferred on account of being able to endure cold weather in spring. Italians are better suited to the warmer parts of the country and it is claimed they resist foul brood better than the blacks. It is quite easy to Italianize an apiary of black bees by replacing the black queens with fertilized Italian queens, which may be purchased from a professional queen breeder.

HONEY PRODUCING PLANTS

In most parts of Canada there is an abundance of nectar to be obtained from wild and cultivated plants. Up to one hundred and sometimes two hundred colonies can be kept profitably in a good location. The bees will cover a range of two to three miles, or in certain cases five miles. The first blossoms to offer food are the willows in late April and early May. About the same time the maples will come in bloom though most of them are of little value for either pollen or honey. Apples, plums and cherries give a brief harvest in May and with the dandelions enable the bees to keep up their stores. It is not until clover opens in June that a surplus can be secured, the combs filled up and sealed. Alsike and white Dutch clover are both good producers but must have fairly warm weather to give best results. In the districts of Ontario where Alsike clover is grown for seed, bee-keeping is an important industry. The wild raspberry contributes much to the honey supply in the newer districts. Basswood trees are less plentiful than formerly. In favorable seasons the yield from them is very heavy; it has a pronounced flavor and is of light color. British Columbia and Northern Ontario have one of the best honey producers in the Great Willow Herb or Fireweed, a plant three to seven feet high bearing reddish purple flowers The duration of honey flow from this plant is seven to eight weeks. Late in August the buckwheat contributes considerable honey of dark color and strong flavor. Last of all come the golden rods and asters which help to replenish the hives for winter.

W RKERS, DRONES AND QUEEN

During the summer months when a hive has its full complement of bees there will be found three different kinds—workers, drones and a queen. To distinguish them attention must be paid to the size and form. Only one queen will be tolerated in a colony, and her special function is to lay eggs from which are raised all the inhabitants of the hive. Her body is long and tapering and is only half covered with the wings. Her head is rounder than that of the worker and the abdomen a little brighter in color. The drones are the male bees and in size are intermediate between the queen and the worker. They are slower in movement and have no sting. At the height of the honey season they are quite

WORKER QUEEN DRONE

numerous and it is essential that they be present to ensure the fertilization of a new queen. Toward the close of the season they are driven out of the hive by the workers. The main population of the hive is made up by the workers numbering forty thousand or more in a fully stocked hive. The building of the combs, the gathering of honey and the nursing of the young bees are the duties of these active members. Their life during the summer is seldom more than five or six weeks. Those that are reared in the fall hibernate through the winter, thus having a longer term of existence. Stings are furnished to both workers and queens, but it is the worker alone that makes use of this means of defence.

FALL MANAGEMENT OF BEES

The prime factor in successful wintering is an abundance of good stores. It is not only possible but quite probable that hives contain sufficient stores if located in the midst of a profuse buckwheat and golden rod bloom. These are the two principal autumnal honey-producing plants in Canada, and by removing the supers—before the buckwheat comes into bloom—the bees are allowed to store all of this inferior honey in the body of the hive for winter consumption.

No successful bee man will, however, trust to chance, the lives of his colonies; he will carefully examine each and ascertain the quantity of honey contained in them. For cellar wintering they should have at least from twenty to twenty-five pounds of honey. The quantity may be ascertained by weighing an empty hive with drawn combs and deducting this weight from the gross weight of each colony; the balance may safely be considered as the weight of

WINTER FEEDING

Bees can be fed in winter, although it is much better to give them ample stores in the fall so that in this respect they can be left alone during the winter. The basis of all food for bees in winter quarters is sugar, either in solid form or as syrup. The preparation of the syrup does not require exact quantities of sugar and water, though for stimulative purposes a mixture of one-half sugar and one-half water is about right. For feeding outdoors, a thinner syrup still is better. For fall feeding, to give colonies the necessary stores for winter, two parts of sugar to one of water is about right. For late fall feeding, two and one-half of sugar to one of water is nearer the correct proportion. For feeding in September, a two-to-one syrup is better, because the bees then have an opportunity to evaporate it slightly. For very late feeding, the bees can not do very much about evaporating, and at such times a two-and-one-half-to-one syrup is recommended.

Feeding in midwinter is best accomplished by preparing cakes of sugar candy and laying them on the frames just above the cluster of bees. It may also be placed between the combs in an upright position among the bees. Another method is to pour it into the combs before it is cold.

TO PREVENT SWARMS LEAVING HIVE

What tends to make bees forsake a hive into which they have been put, providing the hive is wholesome and clean, is lack of ventilation, a hot hive and insufficient room. Keep hives intended for swarms in the shade. Next, when a swarm is shaken in front of or into the new hive, it is well to put a brood chamber even devoid of empty frames under the brood chamber with the frames of foundation. This gives room and helps to give air to the new swarm. Every bee being filled with honey, is giving off more than an ordinary amount of heat. Then again it is well to give plenty of entrance room at first, even to the extent of raising up the hive with strips of wood, seven-eighths of an inch all around from the bottom board. The empty brood chambers and the blocks can be removed after a couple days. It is also well to shade the hive from the heat of the sun for forty-eight hours.

There are seasons in which the bees are more likely to leave the new hive than others, and there are strains of bees which vary in this respect; but if the above instructions are carried out, there is not likely to be any trouble. If the bees persist in leaving the hive under the condition described, and they have a queen, put them into a box with a wire screen on top and put them in the cellar until nearly dark and then hive them.

GETTING BEES OFF THE COMBS EASILY

Nearly all bee-keepers know that if there is a time when bees are vicious and bent on stinging, it is in the late autumn when there is little or no honey coming in, and to attempt to take the combs from the hive and brush them one at a time, is a task that takes considerable nerve. To avoid this, have an assistant to use the smoker. Go to a hive, give a few puffs at the entrance, pry off the upper story, place it on the wheelbarrow, remove the excluder, and put on the cover. This is all done so quickly that the robbers have not discovered which hive you are working on. Have the assistant keep watch on the honey on the wheelbarrow, and smoke away any robbers that may attempt to pilfer. When the barrow is loaded, wheel it into the honey house and stack the hives up near

the honey. Some allowance should be made for the pollen, which is always to be found stored in the combs at this season, for although invaluable in brood-rearing it is of no use to the colony in wintering.

If bees are packed on their summer stands, allow more stores per colony, say, from twenty-five to thirty pounds each, as they will consume more outside than in the cellar, and even with this allowance they will need careful attention in early spring or they will sometimes run out of stores, even if thus well provided for. The feeding should not be done too early nor too late. If too early, the bees will use much of it in brood-rearing; if too late, they will not store it in the combs readily. The proper time is just after the first killing frost, when the nights are cool enough to discourage brood-rearing and yet early enough for the stores to become thoroughly ripened and sealed in the combs before the bees are prepared for winter. At this season feeding can be done quickly and the danger of robbery minimized. The syrup for feeding is made by dissolving granulated sugar in an equal quantity of water.

One thing that every bee-keeper should keep in his mind is the danger of robbing, while feeding is going on. Great care should be taken to avoid spilling syrup on the outside of the hives, or on the ground, or in giving the bees access to it outside of the hives in any way. Do not leave sweets exposed at all during feeding. When you put the feeders on, contract the entrance to a space of one-half by two inches, and when the feeder is removed, leave the entrance contracted, as it prevents the cold air finding its way so readily to the cluster during the cool days, which are sure to come before the bees are put away for winter.

After feeding, the bees require little or no attention until they go into winter quarters. If wintered outside some time in mid-October, they should be carefully packed with some dry porous material, forest leaves are good, but the season's work is practically done when these preparations for winter have been made.

FAVOURABLE WINTERING CONDITIONS

Colonies wintering on their summer stands should not, of course, be tampered with until near spring. One of the necessary conditions with outdoor wintering is an abundance of good food stored and sealed in the combs before the cold weather compels the bees to cluster closely. Those wintered in the cellar should be occasionally visited to note their condition. Should they be quietly clustered on the combs no attention is necessary. The hum produced by the bees is an infallible guide to their condition. The lower and greater the hum proceeding from the hive, the better the condition the bees will be found to be in. When wintering perfectly little perceptible noise will be heard, so if they are noisy look for the cause and remove it.

The principal causes of trouble in winter are too low temperature, variable temperature, or sometimes mice will enter the hives—causing considerable damage by gnawing the combs and disturbing the bees, and making them consume their stores more rapidly. Screens should be placed over the entrances to prevent their entering, but if this has been neglected they should be thinned out by means of traps and poison.

All that need be done is to keep the cellar dark, and the temperature even, at any point between 42 and 45 degrees, and the bees will remain quiet without further attention. Do not disturb them without cause, as an essential condition in wintering is quietness.

a screen door having an escape It would be better if the door had several escapes. Let each hive body extend a little over the end of the one beneath it, so that the bees may escape without going clear up to the top. In this way you can pile them up six or seven high, and almost as close together as the hives will stand. The bees will collect on the screen faster than they can escape, and when quite a number have collected on it push the screen door partly ajar and strike it on the inside with the hand. This will dislodge nearly every one. Be quick about it and close the door before many robbers can enter, for they are sure to be there looking for a chance to get in.

PACKING AND SHIPPING BEES

The manner of packing and shipping bees depends upon the kind of hive and, to some extent, the season of the year. Bees can be shipped at any time during the flying season. If the weather is comparatively cool, as in spring and fall, they do not need so much ventilation as through the warm months. There is little danger, however, of giving too much ventilation at any time. With almost any hive, the entire top can be covered with wire cloth, to make the colony safe against smothering. If the weather is hot, the bees need a supply of water on their journey. This may be given by means of a sponge or a roll of rags saturated with water and placed on top of the frames.

If the hive contains loose hanging frames, these must, in some way, be made fast. This may be done by driving nails through the end of the top bars down into the end of the hive, but the nails should not be driven in to their entire depths. The heads must be left projecting so they can be drawn with a claw hammer. When placed on the cars, the frames must run parallel with the track; on a waggon they should run crosswise.

TO AVOID STINGS

The fear of stings prevents many from keeping bees, and yet— when properly protected with a bee veil, and working only in the warm part of the day, and never when cloudy, rainy or cold, and with the use of a good smoker—one need rarely be stung. There is no doubt that the system can soon become inured to the poison so that no bad effects are produced.

There is a current impression to the effect that bees will sting some people more than others. While this is true, it is not because they are able to recognize any peculiar physical condition or difference, nor is it because one person smells to the bees differently from another. It is because they notice a difference in behavior of different persons Avoid quick motions, do not breathe upon them, and if there are other bees flying about in search of plunder do not leave the hive open too long. In case of accidents the smoker should be used freely, and it ought to be at hand for any manipulation in the apiary. It is much easier to prevent the anger of the bees than to put a stop to it after it has begun. If you mismanage a colony of bees and rouse their anger, it is quite likely that this disposition will remain with them for a few days.

A bee away from home, or laden with honey, never volunteers an attack. This is well established and well known by apiarists. Thus, in order to render bees harmless, it is only necessary to cause them to fill themselves with honey, and this is done by frightening them with smoke. When smoke is driven into a hive through the entrance, the bees at once begin filling themselves with honey. But with them as with human beings, it is the most experienced that are the slowest to take fright. So when the old bees are all at home, it is more difficult,

and takes more time, to compel them all to fill themselves. For this reason it is much safer to handle bees during the warmest part of the day, or at a time when the greater part of the old bees are in the field. The bees which compose a swarm are usually filled with honey for the journey that they expect to take, and are harmless unless crushed or very much irritated by the anger of others and the smell of the poison.

An expert may open a hive without smoke and without danger, and may handle the combs and return them to the hive without getting a single sting by being quiet, steady and fearless. When you are going to open a hive of bees, if you wish to be perfectly safe, arm yourself with a smoker, cover your head with a veil and step boldly to the front of the hive; send smoke through the opening for half a minute, then stop, and repeat the operation after another half minute, or until they make a steady hum, which will show that they have given up the desire to fight. Then open the hive, smoke again gently, and take frames out one after another.

FOUL BROOD DISEASE

The first symptoms of foul brood are only noticeable to the expert on examining the combs in the brood chamber. The grubs, when attacked, turn a yellowish color, and stretch out in their cells, instead of being a pearly white and curled up at the bottom. A bad case is easily recognized by the stench arising from the hive, and given off by the state of rottenness within. On examining the combs, the open cells will be found to contain a dark coffee-colored substance, of a stringy and sticky nature, while those sealed over will be pierced with regular-shaped holes, and appear sunken, instead of exhibiting the prominent and rounded appearance so characteristic of a healthy capped brood.

Whenever a case is found, the hive should be instantly closed, and every precaution taken to prevent other colonies robbing it. At the close of the day, when the bees have about ceased to work, it should be thoroughly overhauled. The best plan to adopt would be to obtain a clean hive, if there are any on hand, then shake the bees from their frames on the alighting board of the clean hive, which should stand in the place of the affected colony. Let the bees run in. Place the bees on starvation diet for at least thirty-six hours, in a closed hive without combs; then put them into a new hive on clean combs, with a fertile queen, and feed sugar syrup.

For light cases, where the disease is discovered just commencing, a ten per cent. solution of formic acid, in weak alcohol, is placed in a small, varnished tin box on the floor of the hive. The vapor from this spreads through the hive and effects a cure, which in many cases, may be hastened by feeding a tablespoonful of the above formic acid solution to a quart of syrup. Formic acid is naturally found in honey, and constitutes the poison of the bee's sting, and when a larger quantity is supplied, in the manner above indicated, it acts as an antiseptic, and prevents the growth of the bacillus which causes the disease.

The best time to cure foul brood is during the honey-gathering season; but, with great care and feeding, it can be done at other times. First of all, have a clean hive; a new one is best, but the old one can be scraped clean, and, to be sure, either boil the hive well or paint it inside with kerosene oil, set afire, and when well going, throw in some water and close the hive tight.

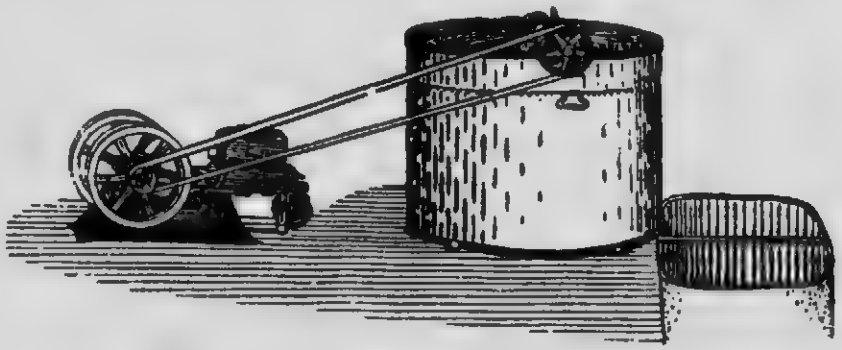
Absolute cleanliness in the apiary is imperative. The hives from which the bees have been removed must not be allowed to stand about while they are holding diseased combs and harboring germs. The frames, combs, quilts and other movable parts of the hive should, the same evening, be put upon a bon-fire, and not left until every scrap is consumed.

TREATMENT FOR MOULDY COMBS

Combs that are not too badly moulded can be used again by the bees, as they will clean them up just as clean as new. If they are in very bad condition it is advisable to render them into wax and use full sheets of foundation in their place. The bees will clean up combs that are in quite bad condition from mould. Care should be exercised in giving them to the bees, especially young swarms, as they are likely to leave such combs. It is well to hive the swarm on a single frame of clean comb or foundation, and give bees the balance of their combs just at nightfall, and by morning they are cleaned and the bees prepared to accept them. You can give an old colony two or three dirty combs at any time and if they have bees to cover them they will at once clean them without difficulty. By following either plan, old combs may be utilized without danger of losing bees by absconding.

COMB OR EXTRACTED HONEY

A beginner in bee-keeping should never attempt to produce comb honey; neither should anyone who has not time enough to devote to the apiary. To manage bees properly for comb honey, the hives should be at their full strength, or in shape to fill the brood chambers and one extracting super when the harvest begins. Then the entire hive must be crowded. Even with the utmost care



HONEY EXTRACTOR OPERATED BY GASOLINE ENGINE

the bees are apt to get the swarming impulse. The honey flow may also stop suddenly, leaving a lot of imperfect and unsaleable sections. In producing extracted honey, once an outfit is complete, there are no supplies required outside of barrels or cans to contain the honey. The combs are extracted and returned to the hive and can, with care, last many years. In the production of comb honey, sections, comb foundation and small and large section crates must be bought.

MARKETING COMB HONEY

As the sections are removed from the supers one by one, clean them from all propolis and propolis stains, as far as you can. For this purpose, a common jack knife is the handiest implement. When scraped, place them in a box, where they will be away from the dust and in no danger of injury. The cases can be secured of any supply dealer, and should be of sufficient size to hold a

dozen sections, having three facing the glass. In putting the honey in the cases, care should be taken to secure them a fair average quality, having a uniform appearance for the face sections. Care should also be taken to have each crate, when filled, of uniform weight. This may be done by having scales handy, and filling each case with sections netting a certain weight per dozen.

Before shipping honey, the cases should be crated in a large crate holding from nine to twelve cases. These crates may be made of any cheap lumber, ripped into strips from one and one-half to two inches in width, and nailed in such a way as to contain the cases and protect them from damage.

The bee-keeper should always aim to produce the very best article possible, and place it on the market in the best possible shape; in fact, have it looking so attractive that it will sell itself. It is also a good idea to have a rubber stamp, and stamp the outside of each case, and in that way advertise the bee-keeper's business by the quality of the goods.

RENDERING WAX

One of the older methods of rendering wax was to fill a porous sack or bag with the cappings and old combs and weigh it down in a large kettle, covering it with water and allowing it to boil until the wax began to rise. When the water became cold, a cake of wax formed at the top. The solar wax extractor is an improvement on this method and is extensively used. This consists of a large glass-covered box into which the old combs are placed and exposed to the sun's rays. Most of the wax is separated by this means, except when the combs are very old and dirty. Wax presses are sold which extract the wax under pressure after it has been subjected to steam heat, but these, of course, are only necessary when a large number of bees are kept.

CLEANSING WAX

While specially constructed utensils for cleansing wax are desirable they are not absolutely necessary. A five-gallon honey can with the top cut out will answer the purpose of remelting very well. Two or three inches in depth of water should be placed in the melting tank and the wax cakes, broken into pieces, placed therein until the tank is nearly full. Melt over a moderate fire, being careful not to bring the wax to a violent boil. The less the wax is boiled the better will be the quality. As the wax approaches the boiling point, certain of the lighter impurities will float on the surface in the form of a scum, which may be taken off with a large spoon. If the wax is kept just at the boiling point for a few minutes all the lighter impurities will come to the surface and may be removed by skimming, after which the wax should be allowed to cool slowly until nearly to the solidifying point. Slow cooling is the means of getting such impurities as are slightly heavier than wax to settle to the bottom. It would be well if the cooling process occupied two or three hours. When nearing the congealing point, the wax may be dipped out of the tank into moulds of the required size and pattern. If the wax is moulded in this way and in small cakes of up to fifteen pounds weight, it will not crack. If the cakes weigh from twenty to forty pounds, they are likely to crack, unless the cooling is retarded by wrapping old carpet or other material about the mould or by setting the same into another vessel slightly larger, such as a butter tub. Such large moulds of wax should be covered with boards, by laying two parallel on top in such a manner as to leave an opening about three inches wide, and then two at right angles to the first two, and in the same manner. This will leave a hole about three by three inches through into the centre of the mould, causing the wax to commence congealing at this point, which will result in a solid cake.

FARM BUILDINGS.

A SETTLER'S HOME.

The requirements of a settler's home are not exacting. The house should be large enough to accommodate the family comfortably. The plan should be arranged for convenience, and the structure should present a pleasing exterior. Cost is a very important factor, as the majority of settlers have but little capital available for the home. Therefore, the design must be simple, the arrangement compact, and all features eliminated which would add materially to the cost. The rooms should be no larger than are required for comfort. Modern conveniences are not often considered for a small design of this type.

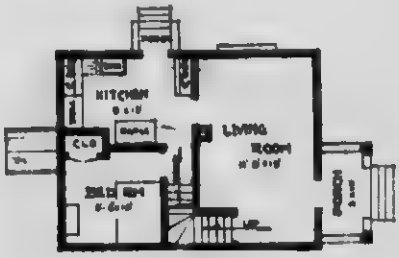
CHEAP AND COMFORTABLE HOUSE.

The following plans suggest a very simple structure. Nothing has been included that is not essential for a small family. The floor arrangements are compact, and every square foot is utilized to good advantage. Very little area has been devoted to halls.

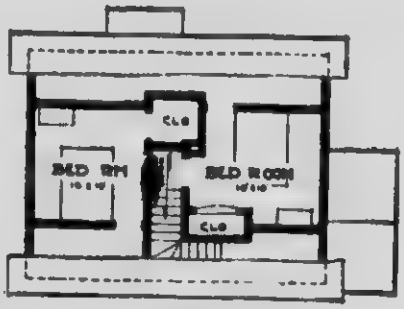
The largest room in this design will serve as a living-room and a dining-room. This arrangement affords one large room, which is always to be desired in a farm home. Windows on three sides provide ample light and afford a view in three directions. The stairway to the second floor is placed in the living-room and near the front entrance for convenience. The chimney is arranged to serve a stove in both the living-room and the kitchen.

A well planned kitchen is a big labor saver. The kitchen in a small house should adjoin to the dining-room and should be close to the cellar stairway. Space can be used most efficiently by substituting cupboards in the kitchen for the pantry, and a more convenient arrangement is obtained. It is always desirable to provide windows on at least two sides of a kitchen, so that cross ventilation may be easily secured in warm weather.

This design includes three bedrooms. Privacy is secured for the first-floor bedroom by arranging it on a short hall just off from the kitchen and easily accessible from the living-room. All three of the bedrooms are provided with large closets.



First Floor Plan



Second Floor Plan

The basement plan consists of a vegetable room, a laundry and a cistern. Large double-sash windows light the laundry, and an outside entrance affords a convenient exit from this room. The rectangular cistern can be built by unskilled labor at a lower cost than an ordinary round cistern outside. The vegetable room provides ample storage for vegetables, fruit and canned goods.

Frame construction with wide, stained siding is suggested for this design. In the majority of cases, most of the lumber can be cut on the farm. If all the material is purchased and all the labor hired, the cost will be about $1,400.

HOMESTEADER'S SHACK.

The shacks built by the settlers in the west are usually about 16 feet by 12 feet with a sloping roof 10 feet high in front and 7 or 8 feet high in rear. To ensure warmth it is advisable to have a d ·ible floor, also to double board and double paper the walls on the outside. Double boarding and papering on inside will be an additional safeguard against frost. Studs should be set 24 inches centres as are the rafters and joists. For a shack of this size about four thousand feet of lumber will be required. The materials will be as follows: 4 sills, 2 inches by 4 inches by 16 feet; 4 sills, 2 inches by 4 inches by 12 feet; 4 plates, 2 inches by 4 inches by 16 feet; 9 studs, 2 inches by 4 inches, by 10 feet; 9 studs, 2 inches by 4 inches by 8 feet; 10 studs, 2 inches by 4 inches by 10 feet; 9 rafters, 2 inches by 6 inches by 14 feet; 9 joists, 2 inches by 6 inches by 12 feet; 1,120 feet surfaced lumber for walls; 252 feet lumber for roof; 2¼ m. shingles; 192 feet rough flooring; 240 feet matched flooring; 752 feet rough lining; 940 feet matched lining; about 8 rolls building paper, 400 square feet per roll.

A portable shack 12 feet by 18 feet can be built by first laying 2-inch by 6-inch joists on the ground or even 2 by 4 inches would do and 12 feet long. Then lay floor in three sections and fasten together on under side. This will make the floor sections each 6 by 12 feet. The overhead joists are to be 2 by 4

inches, 12 feet. Make side walls also in two sections, the front wall section being each 8 feet by 9 feet and the rear wall sections each 7 feet by 9 feet. Build them on the ground and set on floor, then run 2 by 4 inches plates the whole length. The plates will keep the top of wall in line. The end walls are to be done the same way, making the sections 6 by 7 feet. It will be best to put in the gables as temporary as possible. Make room in three sections, the centre one 14 feet by 6 feet and two end sections each 14 feet by 6½ feet.

The following is a bill of material for shack 12 feet by 18 feet:—10 floor joists 2 by 4, 12 feet; 5 sills 2 by 4, 12 feet; 220 feet flooring, 12 feet long; 32 studs, 2 by 4, 8 feet; 10 rafters, 2 by 4, 14 feet; 560 feet sheeting and siding (to be doubled); 270 feet roof sheeting 12 feet long. The sections will have to be built with care, and square. In walls run a strip outside and in to cover the joints.

HOUSE-HEATING SYSTEMS.

For heating a private residence in town or country, hot water heating is the best and most economical system in the long run; it is more costly to instal, but the best in the end. Steam heating is all right in factories and large buildings where there is a man to keep the fire going. It takes a lot of fuel to turn water into steam, though it would cost about ten per cent. less to instal.

Hot air is the cheapest for ordinary purposes, though it is not as sanitary as hot water heating. It takes about the same amount of fuel to heat the house, but the objections to it are that it burns the air we breathe, and the dust of the furnace flies out with it. A furnace may be dustproof for the first year or two, but in time the joints become loosened from expansion and contraction, consequently we get the dust in the house.

The cost of a hot air furnace for a nine-roomed house would be about one hundred and fifty dollars. A hot water heating plant would cost about three times as much, while steam heating would cost about ten per cent. less than hot water.

TO MAKE A FRAME HOUSE WARM.

In order to have a comfortable frame house without using too much fuel in winter, there should be a good 12-inch concrete wall or 24-inch stone foundation, on a thoroughly drained site. The superstructure may have walls built by one or two different methods. The first, or older, way was to double board, with surfaced lumber, on the outside of the wall studs, using one or often two ply of building paper between these boards. Over this was laid another thickness of paper and the outside was completed with a covering of lap siding, or often shingles. The inside was simply lathed and plastered directly on the studs. Later, it has been customary to place only one ply of matched 7-8-inch lumber on the outside, and, using two thicknesses of paper between, cover with the lap sidings or shingles, but on the inside another thickness of 7-8-inch matched lumber is used, and then paper. Over this furrings of lath are nailed vertically to keep joints of paper close and also afford a key to the lath and plaster which completes the inside.

SEPTIC TANK.

For the disposal of sewage from a farmhouse, the septic tank is the most sanitary and most satisfactory system in every way. The cess-pool should never be used except as a last resort, especially where the water for the house is drawn from a surface well. The septic tank disposes of injurious sewage by

converting practically all of the organic matter into liquid form through the agency of bacteria. Of these bacteria there are two kinds. One, working in the dark, liquefies all the solid matter, making the sewage simply a dirty-looking liquid; the other acts in the presence of light and air to oxidize and clarify the liquid, making it clear and bright. Both kinds of bacteria are always in the sewage, and require only proper surroundings to go to work.

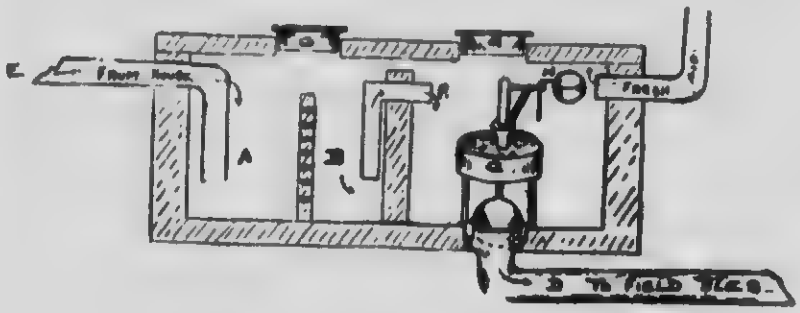


FIG 1. PLAN OF SEPTIC TANK.

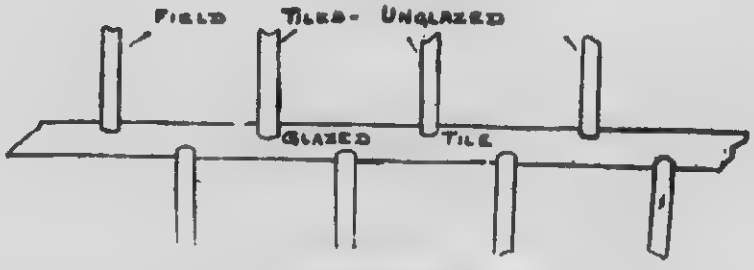


FIG. 2. DISTRIBUTING TILES.

With this principle in mind, the construction of a septic tank is a simple matter. The system includes a dark closed tank of a capacity about equal to the day's flow of sewage, in which the required liquefaction may take place. This tank is usually built underground to keep it warm, and the sewage flows continuously in and out. The remainder of the process may take place by allowing the effluent from this tank to flow slowly through beds of sand or into a system of tile drains laid in such a way that the effluent leaches out and is purified and absorbed by the soil.

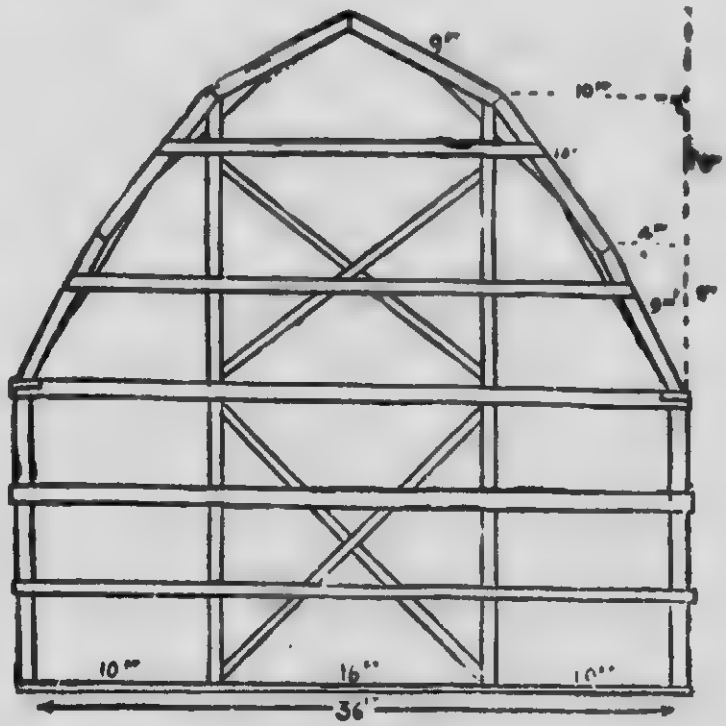
The most approved form of septic tank consists of two chambers separated from each other by a division wall running nearly to the top (Fig 1). The sewage runs into the first compartment through a pipe, E, which should enter near the bottom so that the inflow may not disturb the surface where the bacterial action is taking place. The first compartment is divided into two unequal parts, A and B, by a weir or wall about three-quarters the height of the tank. The liquid sewage flows over this wall in a thin stream into B, and from there gradually runs into the second compartment. When this compartment is filled up to a certain height, a valve releases the contents which then flow out into the sand beds or irrigation tiles. A fresh air pipe runs up in the second compartment to admit the outside air.

The effluent from the tank is, as has been said, a dirty-looking liquid, and to purify this various methods are adopted. The simplest plan is to allow it to flow slowly through artificially prepared beds of sand three feet deep and of sufficient extent so that there is a square yard for every fifty gallons per day Instead of building artificial beds, a piece of ground on a lower level may be used to receive the effluent. Over this the liquid would run between the beds in furrows about four feet wide, or even slowly in a thin sheet over the surface of grass land. If this plan is considered objectionable, the flow may be taken into small tile drains laid about twelve inches below the surface of the ground Each tile should have a right angle branch and these branches should be laid right and left alternately. Each of these lateral stretches of tile should be perfectly level, though any one branch may be lower or higher than another The total contents of the tile should equal or slightly exceed the total contents of the second compartment of the tank to insure a filling of the tile with each flush of the tank. About thirteen land tile, four inches in diameter, and one foot in length, may be calculated for each cubic foot of the tank's contents

In figuring out the size of tank necessary, the following may be taken as a safe rule: For every occupant of a private house, allow three cubic feet of space in each compartment.

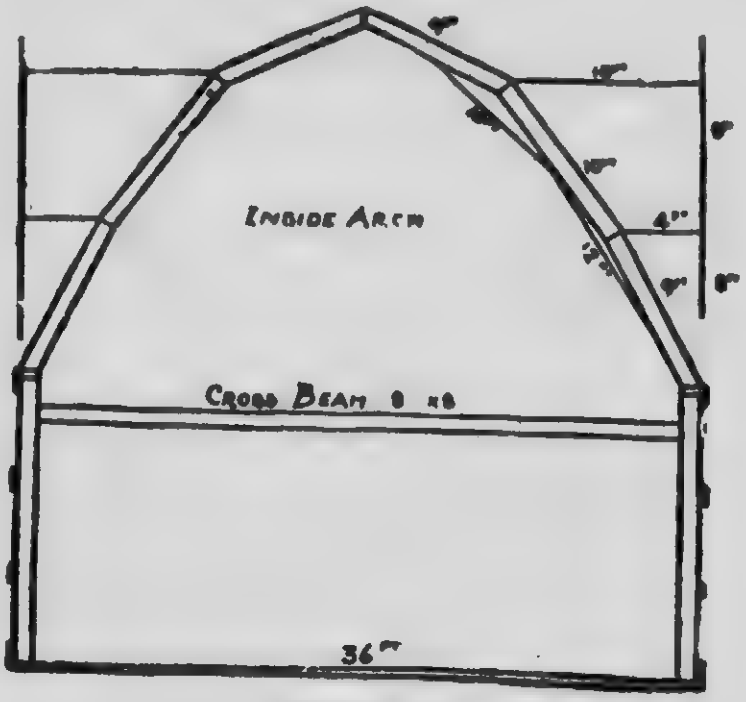
PLANK FRAME BARN.

A great saving in timber is effected in the modern plank frames as compared with the old style timber frame. With less material it is possible to get as much



END BENT,
Showing purline posts, 9 inches by 9 inches and 32 feet in height.

resisting power, and the expense of building is less. In the timber frame, the cross beams give strength to the building and bind the sides together, which is very necessary in the end bents. A weakness of the frame was the projection of the posts four to six feet above the beams, which allowed the weight of the roof to press outward and bear on the weakest part of the posts when they are cut nearly in two by a three-inch by twelve-inch mortise. As a result, many of the roofs become saddle-backed. The illustration shows an end bent of a barn, thirty-six feet by sixty feet, built with plank frame. The only heavy timbers above the basement are two purline posts, to give strength to the end

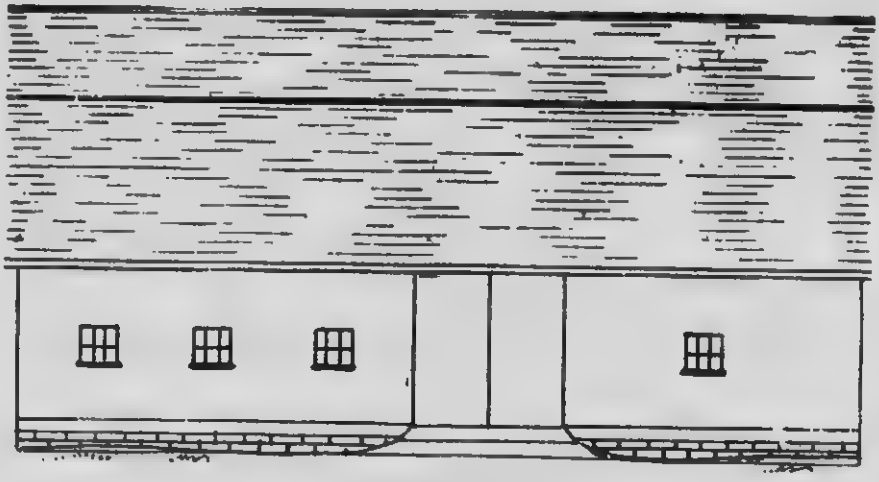


INTERIOR TRUSS.

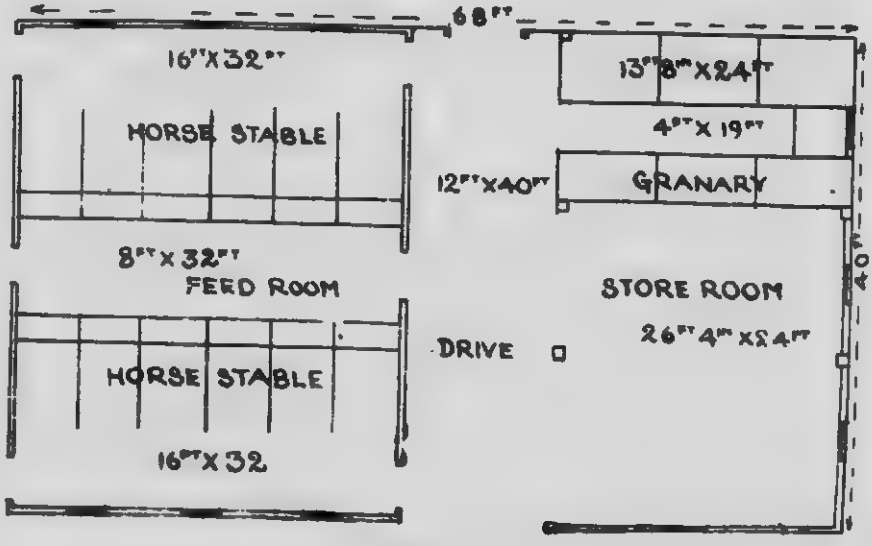
of the building, and two cross beams, eight inches by eight inches, across the centre, opposite the door posts. These latter may be made of four pieces, two inches by eight inches. The door posts are eight inches by eight inches. The side posts are in the form of studs, two inches by eight inches, six feet apart, and plates two inches by eight inches are laid on top of the studs. Then a piece two inches by eight inches is nailed on outside of the plate, forming the top girt on which to nail the siding. Corner posts are two inches by ten inches, nailed together with six-inch nails. Each arch for the roof is made with two-inch by ten-inch plank, and requires eight pieces nine feet long, four pieces ten feet long, two twelve-foot braces and two ten-foot braces. The end bents each have purline posts nine inches by nine inches and thirty-two feet in height, corner posts two inches by ten inches, cross beams two inches by eight inches, with side and end girts two inches by six inches.

A WESTERN BARN.

On many farms in the wheat-growing sections the accommodation of the horses is the chief consideration, the number of cattle being small. To combine a stable and a granary or store-room is often desirable, and the accompanying plan shows how this may be arranged. The size of the barn is forty feet by sixty-eight feet, and the posts are fourteen feet high. To the left of the driveway is a feed alley and two rows of horse stalls. The same division of space will answer if cattle are to be kept on one side, but the stalls will be of different style. The granary is thirteen feet eight inches by twenty-four feet, and will hold one thousand bushels of grain. Both the stable and granary parts should be eight feet high. If more room is required in the loft, the post might be made eighteen feet high without adding much to the cost of the barn.



FRONT ELEVATION.



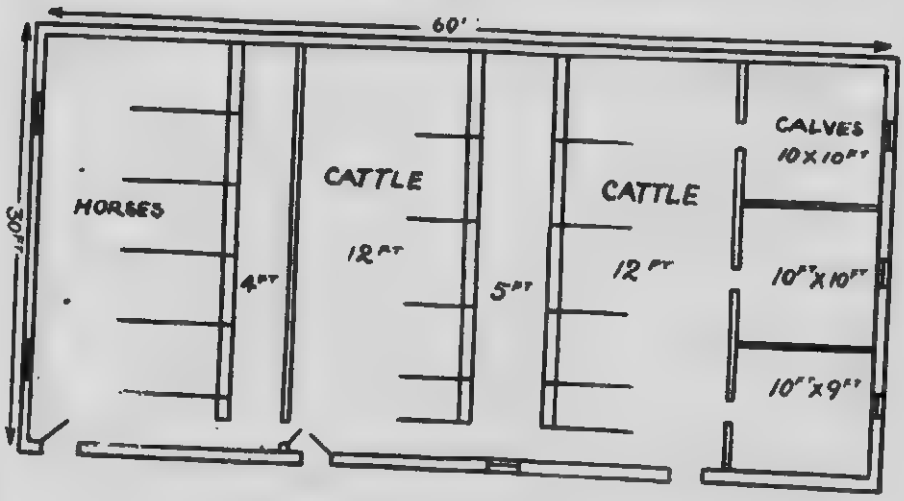
FLOOR PLAN.

GRANARY FOR 3,000 BUSHELS.

A granary for 3,000 bushels will require to be 26 feet by 30 feet allowing an average depth of 5 feet all over. To safely store this amount will require a very strong building, and, in consequence of this, it would be best not to build side walls over 10 feet high and use 2-inch by 8-inch studs, set on 24-inch centres, tying across the bottom with 3 inch by 10 inch joists at every stud. Also securely tie top of walls with 2 inch by 6 inch, or 2 inches by 8 inch at each 24 inch space. Rafters may be 2 inches by 6 inches and roof boarding of surfaced 7-8-inch material, laid close, gives level surface for paper roofing. Side with good strong lumber, nailed securely to studs, and to further support sides a few braces might be nailed diagonally from floor joists up to centre of wall studs. Floor with 1 1-8-inch or 1 1-4 inch spruce. Use sills 8 inches by 8 inches or 9 inches by 9 inches with centre girder of same dimensions running full length of building. To facilitate unloading, numerous doors, 3 to 4 feet above sills, may be arranged on sides, while large doors at centre of building will be convenient for loading for market.

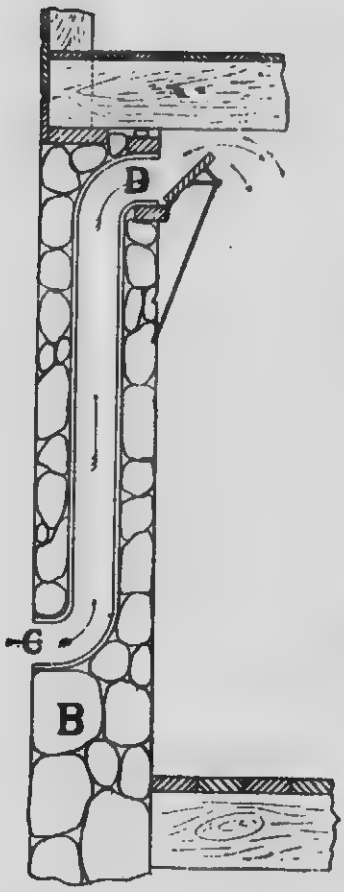
STABLE FOR HORSES AND CATTLE.

A stable of the ordinary size, thirty feet by sixty feet, as shown in the plan, will accommodate five horses, twenty cattle, and allow for three box stalls at the end. One of the horse stalls can be made into a box stall for mare and foal, if so desired. The horse stalls are eight feet long from front of passage to rear of stall, and five feet wide. Cattle stalls are eight feet long and six feet wide, to hold two full-grown animals each. The floor should be laid with concrete, which will require fifteen barrels of cement, thirty yards of gravel and five yards of sand. The concrete of the stalls should either be furrowed, to prevent slipping of animals, or be covered with plank.



VENTILATION OF STABLES.

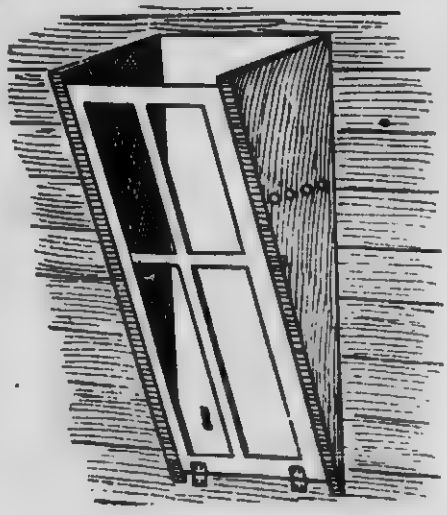
The object of ventilation is to obtain a supply of fresh air and at the same time to avoid cold drafts and dripping of condensed moisture. Advantage is taken of natural forces to bring air from outside and to remove foul air from within. When air is warmed it expands, and thus becomes lighter, and in con-



sequence rises and is replaced by cooler air. In an occupied room or stable the heat from the bodies of the occupants warms the air and produces the upward current, the cooler fresh air from outside taking its place. Another natural aid to ventilation is the wind, and when the fresh air inlets are on the windward side of a building there will be no difficulty about the supply of air. To make free use of the wind it is necessary either to have inlets on all sides of the building, or to have inlets that always face the wind. The King system of ventilation provides for a considerable number of flues in all the outside walls, arranged in two sets, one for the entrance of fresh air and the other for the escape of vitiated air. The greater the number of flues the more effective the ventilation, and it is recommended that the inlets be placed ten feet apart. In stone walls the intake pipes require to be arranged for during construction. They are made of vitrified sewer pipe or ordinary clay tile. The air current is directed upward, and enters near the ceiling, where a shutter or valve controls the flow of incoming air. The flues for taking out the foul air are two in number, one located midway in each side wall. These flues meet in a central flue or chimney, which extends upward to the ridge. Either galvanized iron or a combination of paper and lumber should be used in the construction of these foul air flues. They should also be as straight as possible, and the end should rise above the highest part of the roof. Since foul air tends to settle near the floor, the openings of the foul air flues should be near the floor.

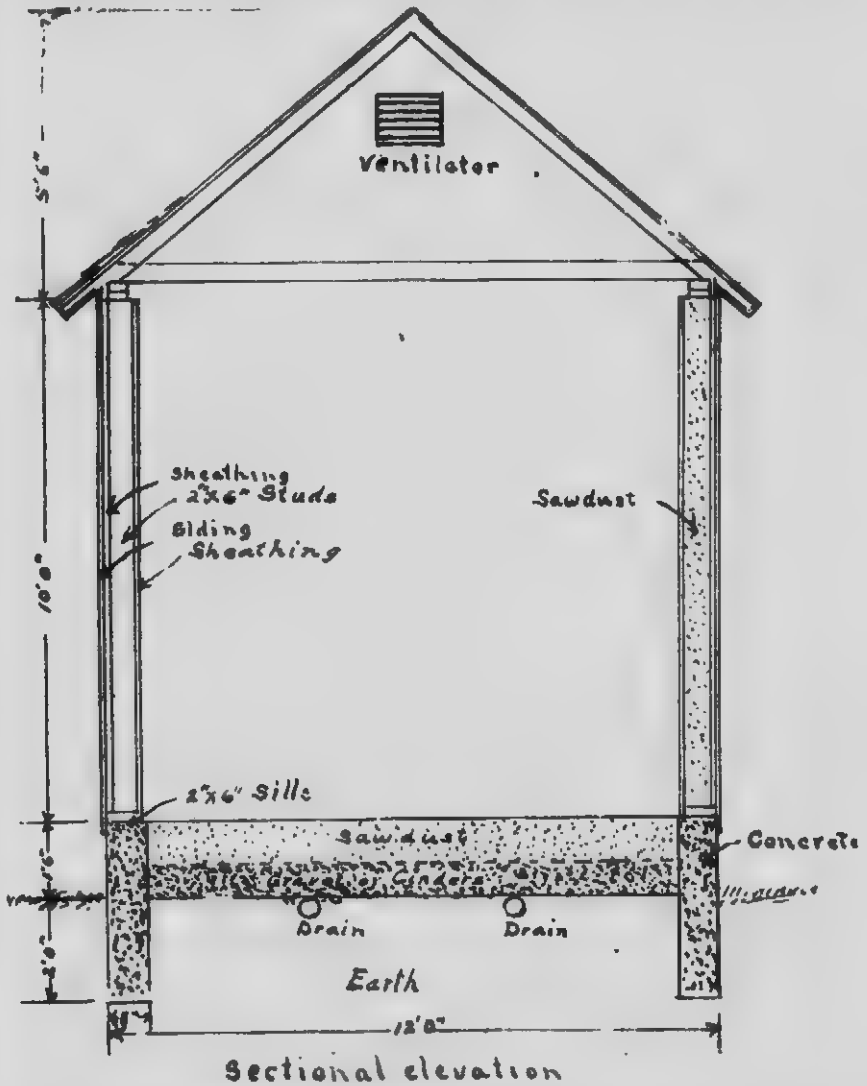
WINDOW VENTILATION.

By using a full sash, hinging the window at the bottom and allowing the top to open inward, air can be admitted into a stable without making a draft. Holes may be made at each side, as shown in the illustration, and by means of a pin the window may be opened as far as desired, and the amount of air entering thus regulated.



A FARMER'S ICE HOUSE.

The site chosen for an ice house should be easily drained. The building may be placed on stone or cement walls, or on cedar posts set in the ground two feet at least. Excavate at least one foot below the sill and fill with cobble stones or very coarse gravel the whole of the inside between the sills, smoothing off the surface with fine gravel or cinders. If the digging shows a clay soil, a drain should be put in to carry off surplus moisture. Scantlings can be bedded in the fine gravel on which to place a floor of cheap lumber, placed one inch apart



Sectional elevation

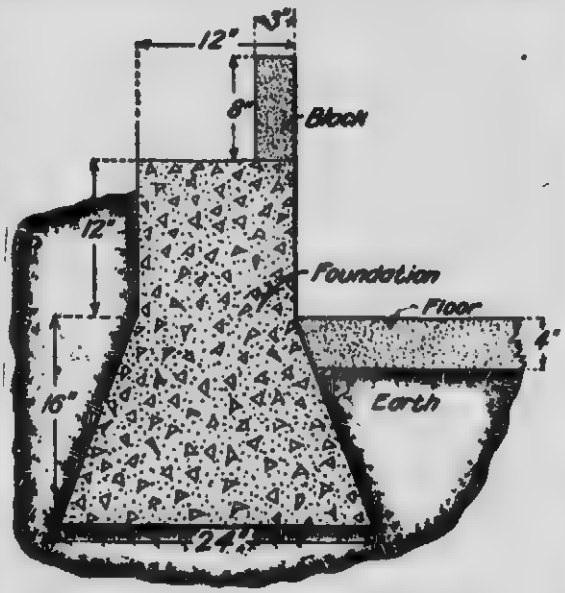
to permit the water to pass through readily. It takes on an average from 40 to 45 cubic feet to hold a ton of ice, consequently a building 12 by 16 feet by 12 feet high would hold about 45 tons of ice well packed. On the outside of house nail sheeting of common lumber, on which tack a double thickness of building

paper, then strips 1 by 2 and 12 feet long. Over this put a double thickness of building paper and finish with matched siding. This gives a hollow dead air space of one inch to prevent the heat of the sun penetrating to inside lining. On the inside, nail sheeting, filling the six-inch space with cinders, shavings or sawdust, as is most convenient. Over this sheeting nail a double thickness of paper, on which nail half-inch strips again, and on these sheeting, thus making two hollow spaces of dead air one inch each and one space of six inches filled, six thicknesses of building paper, three of sheeting and one of good siding.

For the roof, use 2 by 4 for rafters, lining the under side and filling between the rafters with dry shavings. Under the shingles place two thicknesses of building paper, placing a ventilator in the centre of the roof, made so that it can be closed inside if desirable. The door should be made in two halves, and a door in the gable over the plate to put in and take out the ice for the two top layers. The gables should be built the same as the walls. If the outside of the building is painted white, it will help to keep it cool. In filling the house, place the ice on its edge, placing every alternate layer crosswise. Opposite the doors lay short pieces of boards and fill the door space with shavings or sawdust. When the house is filled put two feet of straw or sawdust over the ice, tramping it well.

CONCRETE SIL

A form of silo adopted in some parts of Michigan has a foundation of solid concrete and a wall of concrete blocks, each with a face twenty-four inches by eight inches, and a thickness of three inches. The inside diameter of silo is twelve feet, and the height twenty-eight feet. As shown in the illustration, the foundation extends twenty-four inches below ground and four inches above. At the base it is twenty-four inches thick, narrowing to twelve inches, which is the thickness of the upper portion. The blocks for the wall proper are laid in cement mortar (sand and cement in the proportion of two to one), flush with the inner edge of the foundation as shown in the illustration. The wall, which is twenty-eight feet in height, is strengthened by two-inch band-iron hoops on the outside, such as are sometimes used on stave silos. The hoops are placed about thirty-three inches apart, and are drawn firmly against the wall by lugs. In the doorway behind each of these hoops is fitted a piece of wood one and one-half inches by four inches, to prevent yielding of the boundary wall of the doorway when the hoops are drawn tight. These pieces also act as supports to which are nailed

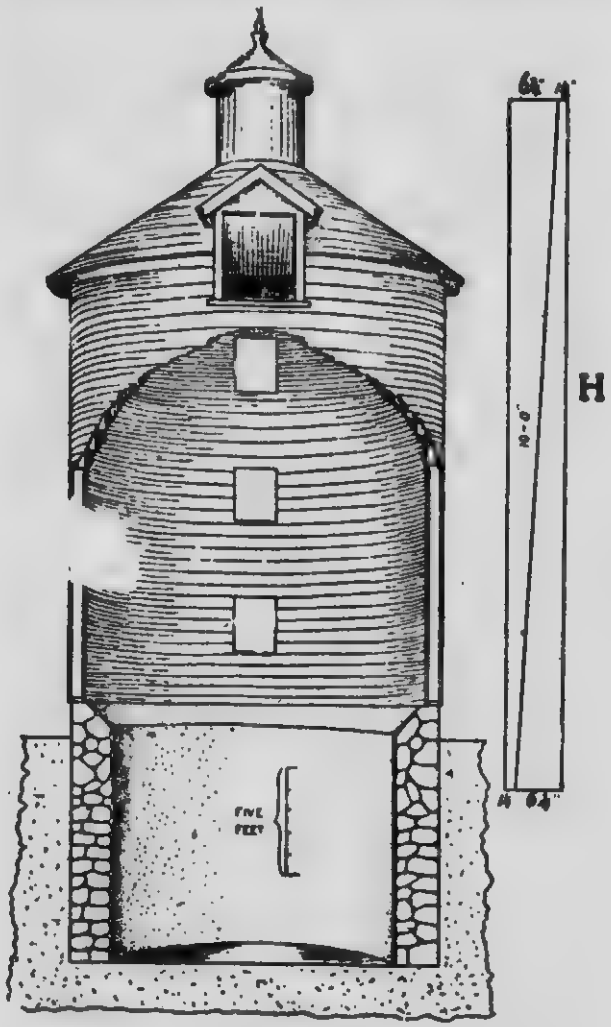


FOUNDATION OF CONCRETE BLOCK SILO.

pieces of two inch by four inch for frames for chute and for ladder for reaching the upper portion of doorway. The door, which extends from the first course of block to roof, is made in sections, using two thicknesses of flooring with two thicknesses of tar-paper between. The inner thickness of flooring laps two inches when in place, as does the paper, on either side of the doorway, and rests against the inner surface of the wall. The sections are made to lap upon each other, and are held in place by the pressure of the silage. A half-inch coat of rich cement plaster, and on this a coat of rich cement wash, will render the inside air-tight.

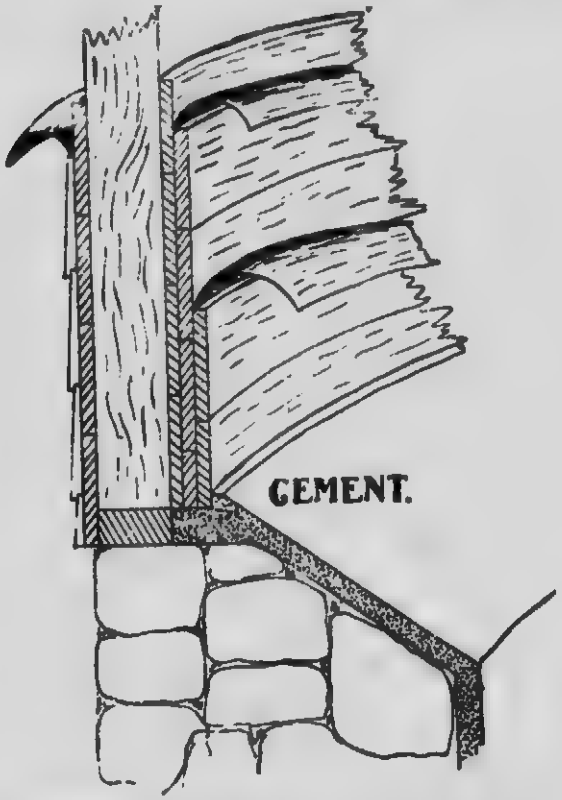
WOODEN SILO.

A round wooden silo can be erected at moderate cost, and will serve the needs of an ordinary dairy farm. A circular foundation of stone or brick, eighteen to twenty-four inches thick, and extending below the frost line, is first put in. The bottom of the silo may be of concrete or well-packed clay. The sills should be made of scantling, two inches by four inches, cut to two-foot lengths, properly bevelled, toe-nailed together and bedded in mortar or cement on the outer edge of the foundation wall. The inner edge of the foundation wall should slope smoothly downward, so that the silage may settle. The studding is two-inch by four-inch scantling, set one foot apart from centre to centre and toe-nailed to the sill. The studs are set first in the angles of the sill, and plumbed and stayed from a post in the centre. As soon as five or six studs are up, they



ROUND SILO ON STONE FOUNDATION.
H shows method of sawing boards for conical roof.

are stayed and plumbed from side to side by tacking a strip of half-inch sheeting to them on the outside, as high up as a man can reach. After the studs have been set at the angles, the intervening ones may be put in. On the side of the silo where the doors are to be built for taking out the silage, the studding on either side of the door should be set double. A stud is set in the centre between these and the doors cut out afterwards. A layer of building paper is placed over the siding, and outside of this a single layer of bevelled siding, rabetted on the inside of the thick edge to fit the thin edge of the board below. For lining, two or three layers of half-inch sheeting should be used, with paper between, as shown in the illustration. The paper should lap about two inches, and the edges are tacked down. The roof boards are made by ripping eight-inch common boards diagonally so as to make two boards six and three-quarter inches wide at one end and one and one-quarter inches at the other. These are nailed to the plate and to a circle made of two-inch stuff cut in sections and joined together.



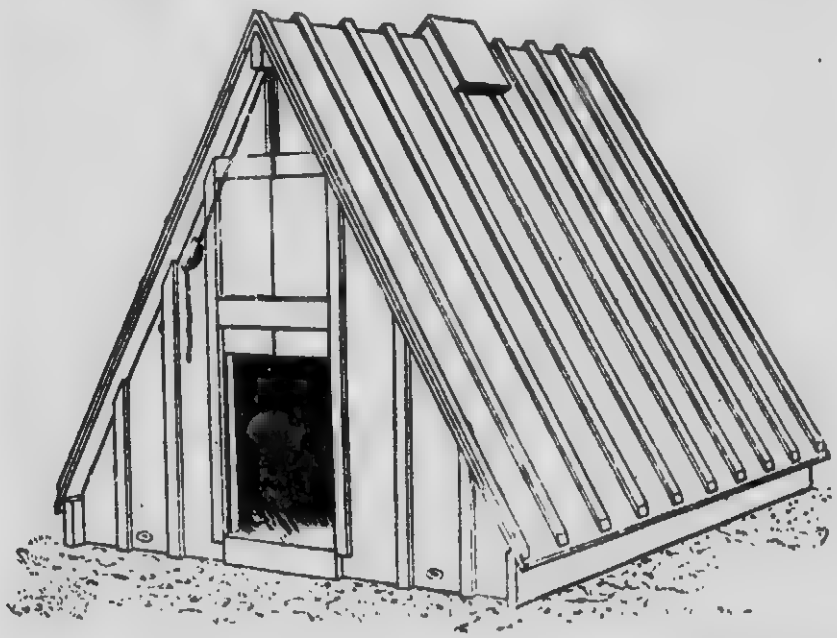
CONNECTION OF WOODEN PART WITH FOUNDATION.

A HOG COT.

The A-shaped hog cot has been modified and improved to adapt it to both summer and winter conditions. The improved form has a permanent floor, a door in each end, and a ventilating system. It is constructed by nailing inch boards on six joists, two inches by four inches, eight feet long, for the floor. Beneath the joists are nailed three stringers, two inches by six inches, eight feet long, which serve as runners for moving the house. Next is spiked a piece two inch by eight inch, nine feet four inches long at each end of the joists, having the bottom of the two inch by eight inch piece even with the bottom of the joist, which will allow it to project above the floor three inches. It will also extend seven inches at each end. This two inch by eight inch piece, forms a plate to which the rafters and roof boards are nailed. The seven inch extension of the plate at the ends supports the lower corners of the roof, which otherwise would

be easily split off. These two inch by eight inch pieces besides strengthening the house, raise the roof boards and rafters nailed to them at least three inches off the floor, and thereby materially increase the floor space and the capacity of the house. If the house is to be used in extremely cold weather, a movable door is necessary. The illustration shows a door two feet wide and two feet six inches high, made to slide up and down and held in place by cleats. It is suspended by a rope which passes through a pulley at the top, and is fastened to a cleat at the side near the roof. The cut also shows two iron eyes bolted into the front joist of the building, to which the hitch is made when the building is moved.

A rear door identical in size with the front door, is held in place by cleats nailed across it on the inside, and by buttons fastened on the outside. This door is not opened regularly, but provides ventilation in summer and aids in handling sows at farrowing time. Above the rear door is a small sliding door, eight by twelve inches, to admit light and air.



Another important feature of this house is the ventilator, which is a small cap covering a hole at the top and the centre of the roof. The hole is made by sawing off opposite ends of two roof boards, and covering it with a cap so arranged as to leave openings three inches by twelve inches on each side of the roof. This is sufficient ventilation for two or three animals when all the doors are shut, and if more ventilation is desired it can easily be secured by opening the small sliding door in the rear. This simple plan of ventilation avoids any direct drafts upon the animals, and proves very efficient.

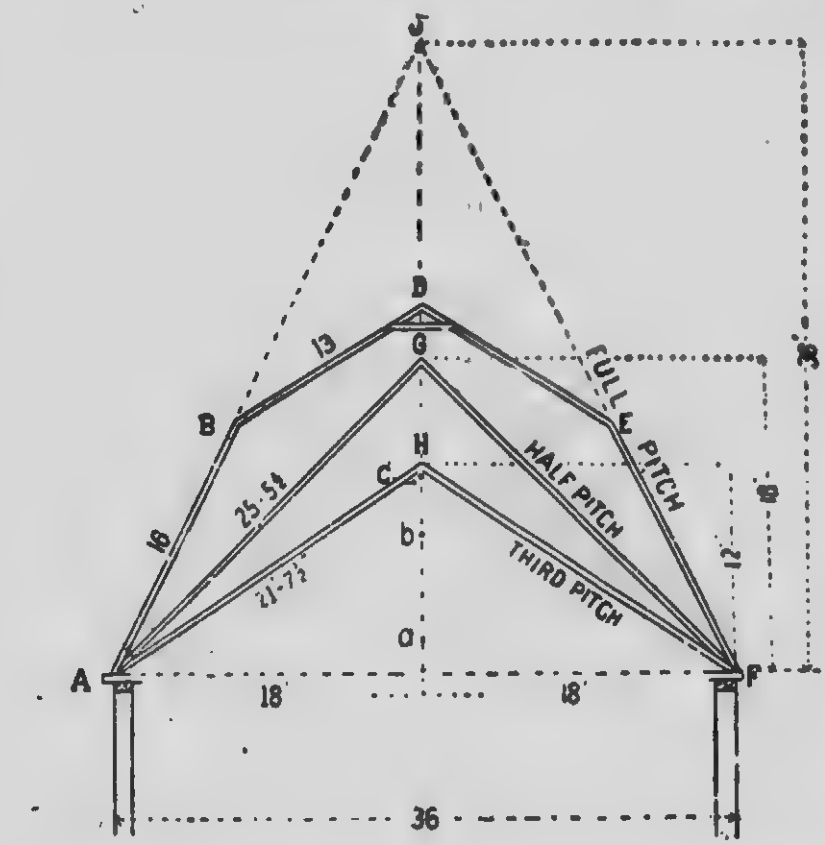
With these improvements, the cost of building the A-shaped house is somewhat increased. All the boards except those used for the floor should be dressed on one side.

The following lumber is necessary to construct this portable house:—Nine pieces one by twelve inches, sixteen feet long, and eleven battens, sixteen feet

long, for roof; five pieces one by twelve inches, fourteen feet long, for ends; one piece two by four inches, ten feet long, for ridge; two pieces two by eight inches, ten feet long, for plates; seven pieces two by four inches, sixteen feet long, for rafters and braces in frame; three pieces two by six inches, eight feet long, for stringers; and four pieces one by twelve inches, sixteen feet long, rough, for the flooring.

PITCH OF ROOFS.

The illustration shows cross sections of three sets of rafters having different pitches. The span is thirty-six feet and the lower rafters AH and FH have a rise of twelve feet. As twelve feet is one-third of thirty-six feet, they are said to have one-third pitch. This is the style that has been largely used, but where hay machinery is used the higher forms are more suitable. The rafters AG and FG have a rise of eighteen feet, which is one-half of the span thirty-six feet; hence



in this case the pitch is called one-half. This pitch is used on houses having a nice appearance and allowing the water to drain off so thoroughly that shingles will last longer. The letters A B D E F indicate the outline of a high roof, the lower rafters of which are full pitch. In a full pitch roof the rise doubles the run—that is, the height is thirty-six feet, while the horizontal run is only eighteen feet. It would not be desirable to have a full pitch, except in connection with

the hip or curb roof, where the lower rafters are at full pitch, and the greatest possible storage is secured. In the plan shown the lower rafters are carried along the full pitch line for a distance of sixteen feet. The upper rafters have one-third pitch.

The length of rafters for the most common pitches can be found as follows, from any given span:

If ¼ pitch, multiply span by .559, or 7-12 nearly.
If 1-3 pitch, multiply span by .6, or 3-5 nearly.
If 3-8 pitch, multiply span by .625, or 5-8 nearly.
If ⅓ pitch, multiply span by .71, or 7-16 nearly.
If 5-8 pitch, multiply span by .8, or 4-5 nearly.
If full pitch, multiply span by .1.12, or 1 1-8 nearly.

To the lengths thus obtained must be added the amount of projection of rafters at the eaves.

As rafters must be purchased at even lengths, a few inches more or less on their lengths will make a difference to the pitch so slight that it cannot be detected by the eye.

Example—To determine the length of rafters for a roof constructed one-half pitch, with a span of twenty-four feet—24 multiplied by .71 equals 17.04; or, practically, just seventeen feet. A projection of one foot for eaves makes the length to be purchased eighteen feet.

TO ESTIMATE STUDDING.

To estimate the quantity of studding required for a frame building, find the number of lineal feet of partitions and outside walls and allow one stud for each foot. If set to the customary sixteen-inch centres, this will give the extra studs necessary for doubling up around doors and windows.

COVERING CAPACITY OF SHINGLES.

Shingles of the average size of 4 by 16 inches are taken as a basis of calculation.

100 sq. ft. will require laid 4 inches to the weather..... .....900 shingles
100 " " " " " 4½ " " " " .....800 "
100 " " " " " 5 " " " " .....720 "

One thousand shingles require 3½ pounds of four-penny nails.

Five to ten per cent. should be allowed to these figures to cover waste and shortage.

MAKING CONCRETE.

Concrete, which is really an artificial stone, is made by mixing pieces of stone, which may vary in size from a walnut to a hen's egg, with clean, coarse sand and first-class cement, using enough water to make a mushy mixture about the consistency of heavy cream. The action of the water on the cement causes the mass to begin to stiffen in about half an hour, and in from ten to twenty-four hours it becomes so hard that an impression cannot readily be made by pressing on it with the thumb. In a month's time the entire mass becomes one hard stone.

Care must be exercised in selecting the materials for preparing the concrete. The best stone is one which is clean, hard, and breaks with sharp angles. Trap, granite and hard limestone are among the best; the use of shale, slate

and soft limestones and sandstones should be avoided. The crushed rock should be screened on a one-quarter inch screen, to remove the fine particles. These small particles should be considered as sand; and, if insufficient in quantity to make the proper proportion of the concrete, enough sand should be added to them to produce the required amount.

Gravel, well graded in sizes, is at least equally as good for concrete as crushed stone. Bank-run gravel, just as dug from the pit, seldom runs even, and rarely has the right proportion of sand and pebbles for making the best concrete. The proportion most suitable is one part sand and two parts gravel, measured by volume, in which all sizes passing through a one-inch mesh screen and retained on a one-quarter inch screen are considered gravel. As there is usually too much sand for the gravel, it is both advisable and profitable to screen the material and to remix them in the proper proportions. Gravel should have no rotten stone, and should be clean, so that the cement may adhere to it tightly.

With dirty sand, no amount of cement will make strong concrete. Generally sand is clean, but if not, it can easily be washed by playing a hose or flushing water upon thin layers of sand placed on a tight-jointed inclined wooden board. In size of grain, it should vary uniformly from fine to coarse. All particles passing a one-quarter inch screen may be considered sand.

Any good-tasting drinking water is suitable for concrete. Do not on any account use sea-water.

It is always desirable to use cement of a high grade, that is, cement that will stand a high tensile strain. A high-grade cement is usually higher-priced, but, being stronger, will go further in any class of work, with better results, than an inferior quality. The different brands of cement vary in the time required to set or harden. Many of them set quite slowly, but are superior to some of the fast-setting brands. Yet, when a fast-setting cement can be had of high grade, it is better adapted for many kinds of work, especially sidewalks, where it may be necessary to finish off the face quickly.

The proportions of the various ingredients vary according to the class of work for which the concrete is to be employed. For most work on the farm, the proportions may be 1 : 3 : 6, that is, one part cement, three parts sand, and six parts broken stone. If gravel from a natural bank is used without screening, use the same proportion called for of broken stone, but omit the sand; that is, for the proportions given above, use one part cement and six parts unscreened gravel. It is of the utmost importance that the correct proportions of the various materials be used, and, to make sure of this, some ready method of measuring them is necessary. Measurement by counting shovelfuls is a poor and uncertain practice. The best and most convenient way is to use a measuring-box or frame. A bag of cement is approximately one cubic foot, and this makes a very convenient unit of measurement. If a box is made one foot square and one foot deep, it will contain one cubic foot, and constitutes a handy measure for small batches of concrete. A shallow, bottomless frame is also a convenient means of measuring. This frame should be made of such a size that it will contain the full amount of sand or one-half the quantity of stone or gravel required for one batch of concrete: For example, if two bags of cement are to be used in making the concrete in the proportions of 1 : 3 : 6, there will be required six cubic feet of sand and twelve cubic feet of stone or gravel. The frame should, therefore, have a capacity of six cubic feet, which can be arrived at by making it three feet by four feet by six inches deep. If this is filled once with sand and twice with broken stone, or with gravel, it will give the quantities required for two bags of cement.

There are several methods used in mixing concrete, according to the amount and kind of work to be done. For instance, where large piers, abutments or retaining walls are to be built, a large rotary mixer run by steam is used to advantage. For lighter work, such as sidewalks, reinforced concrete buildings, etc., a small portable power mixer is used. But the commonest way, especially for farm buildings, basement walls, houses and floors, is mixing by hand. To secure good results, a mixing platform is necessary. This should be about ten or twelve feet square, and is made by laying down two-inch by four-inch scantlings, about two feet apart, and nailing one-inch boards to these, taking care that the joints are tight. A wooden strip nailed around the outer edges will prevent the loss of liquid cement.

When everything is ready, lay the measuring frame on the mixing board, and, if unscreened gravel is to be used, fill the frame level full with the gravel. Lift the frame, spread the gravel slightly with the garden rake, and upon it distribute evenly two bags (the full amount) of cement. Set the frame upon the levelled surface of cement and gravel, and again fill in the same way. Remove the frame, spread the entire mass by raking it back and forth, and then let two men, opposite each other, turn the batch with square shovels. Again use the rake. Keep turning until the cement no longer shows in streaks and the mixture has a uniform color. Throw up the ragged edges, and with sprinkling can or hose with spray nozzle, moisten the mass. Turn again, and add so much more water as may be required. If dry streaks are still evident, continue the turning until they disappear. With wheelbarrows, quickly remove the concrete and immediately use it in the work.

If crushed rock or screened gravel is to be used, fill the bottomless frame with sand and distribute upon it two bags of cement. Drag the material back and forth with the garden rake, then turn, as described above, until the mass has a uniform color. Spread the material so that two framefuls of crushed rock or screened gravel may be placed upon it. Wet the mass and turn as for unscreened gravel until each stone is coated with cement mortar.

Since crushed stone is more or less porous, it is advisable in dry, hot weather to keep the stone pile wet, or at least to water the stone well as it stands on wheelbarrows ready for the mixing board.

LAYING A CONCRETE FLOOR.

In building a concrete floor, get grades all properly fixed. Cover the ground with one or more inches of stone or gravel, well rammed, before putting down concrete. Cover this with three inches of rough concrete, gauged six of gravel to one of cement. Ram this solid, and put on a finishing coat, one inch in thickness, of two parts clean, coarse, sharp sand or fine gravel, to one part of cement, which is also firmly rammed, while the lower concrete is still soft. The work can be best done by setting a 2 x 4 scantling on edge, commencing at one end of the building, about three feet from the wall, holding the scantling in place by two iron or wooden pins. Ram the rough concrete approximately level within an inch of the top of the scantling. Then spread on fine concrete, so that when thoroughly rammed it will be level with top of scantling. Trowel the surface true to grade. Now move along the scantling another three feet, and repeat the process until the floor is finished.

A GRANOLITHIC WALK.

It is important that the ground upon which the walk is to be built be well drained. If in clay soil, excavate to a depth of fifteen inches from the line of

the top of the walk; fill in ten inches deep with broken or cobble stone; on this place gravel or cinders enough to fill the open spaces or crevices,—this forms a drain as well as a foundation for the walk. Have tile drains from this to outlets where required. Now place 2 x 5 or 6-inch pieces on edge at each side of the walk, and level with the top surface. Brace these to keep them from spreading. Now mix six parts gravel to one part of cement, and put in four inches deep. Small stones can be added to this coat, having them thoroughly bedded. If broken or crushed stone is used, the proportions usually are three parts of sand and six parts crushed stone to one part of cement. Ram this thoroughly, keeping it down one-inch from the top of the scantling to leave room for the finishing coat. Now mix two parts of sand, or the screenings of gravel to one part of cement, and apply this to the foundation layer before it becomes set so as to secure a perfect bond. Screed it off, and float with wooden float. Sift dry cement on top of this, allow it to stand for a few minutes, and trowel down smooth. Use an edger and divider and fitter or brass roller to finish the top of the walk.

To divide a walk into blocks, use a cleaver to cut through the bottom coat, and fill the space with sand before putting on the top coat. Use a divider in the top coat directly over this division, so as to have blocks properly divided so that they will not break should they be heaved by the frost. If the walks are built on sandy or gravely soil, the under drain is not required. If curbs are wanted, either use curbing stone or a six-inch thick concrete wall from the bottom of the excavation up to the bottom of the walk, then build the walk as described above, having it lap over on top of the curb wall.

CONCRETE BUILDING BLOCKS.

The usual proportions for making concrete building blocks are seven parts gravel to one part of cement. If one has gravel of good quality, clean and of the proper grade, use six parts gravel to one part of cement. To make a neat finish on the blocks, use fine, clean, sharp sand, two and one-half or three parts of sand to one of cement, according to the quality of sand. In filling the mould with concrete, put in on the face side enough of the fine material to fill up voids that may be in the concrete. Make this fine concrete a little more moist than the coarse concrete. On making one block one will be able to judge the amount of fine concrete to use. By moulding the blocks in this way a smooth face may be secured. To keep concrete from sticking to wooden moulds, line them with sheet iron, galvanized iron, or tin. Care should be taken to have the moulds perfectly clean before refilling.

CONCRETE FENCE POSTS.

Concrete fence posts can be made a success if sufficient care is taken in making them. For an ordinary fence post, that is, a plain, straight one without any mouldings, take planks and make a box with three sides (the one side being left open), seven inches square at one end and six at the other, and the length required; tack a three-quarter inch bevelled strip in each corner of the box and bore three-quarter inch holes in the bottom plank the distance apart that the wires are to be when the fence is completed. Place round pins in these holes two and one-half inches long. Lay the box down flat and fill with concrete an inch thick, well rammed in; then place two No. 9 wires lengthwise of the post along each side of the post and one inch from the plank, then fill in with concrete until within an inch of the top of planks; place two more wires

in the concrete the same as before, then fill to the top of plank and trowel it off, bevelling the corners the same as the lower ones. This will leave a wire at each corner of the post, and will add to its strength very much. For as small a post as the one described, it would be better solid than hollow.

One barrel of cement will make about fifteen posts, making the concrete one of cement to five of gravel. Frost will have no effect upon concrete if the proper materials are used and it is properly made. A barrel of cement contains about four cubic feet, so by making the concrete one part cement to five of gravel, it would require about twenty cubic feet of gravel per barrel of cement.

CONCRETE TROUGHS.

The old, insanitary wooden water-trough is gradually being replaced by the concrete trough, which is water-tight, can be kept as clean as a dish, and cannot decay. It will last forever.

A trough may be built by the roadside or in the barnyard. The length is about eight feet, the width at the top two feet, and at the bottom one and a half feet, these being the inside dimensions. The trough must, of course, rest on a good foundation, and to guard against any danger of cracking by sudden change in temperature, or by the expansion resultant from the freezing of the water in the trough, a 3-8-inch steel reinforcing bar should be placed completely around the trough, about two inches from the top of the outer wall. The only other reinforcement needed is in the bottom of the trough, and consists of expanded metal reinforcement, or some woven wire fabric which is manufactured for this purpose, and may be obtained from a dealer in builders' supplies.

The foundation of the trough should extend below the frost line, and should be porous, and, if possible, provided with a tile drain to carry off any water that may collect. Fill the excavation for the foundation with broken stone and gravel or cinders, pounding it all down solid and levelling off the top at a point just below where the finished grade will be. The outside form is a bottomless box, eight feet eight inches long and two feeteight inches wide, made of two-inch planks smoothly dressed on the inside and securely braced. All forms for this work should be dressed and well greased. The concrete should be mixed in the proportions of one of cement and three of sand to six of gravel and should be what is called a wet mixture.

Having built the foundation firm and level, set the box on top, and fill in with concrete to a depth of two and one-half inches, tramp down thoroughly, and lay the expanded metal reinforcement. Add two and one-half inches more concrete to the thickness of the bottom, and trowel off smooth, similar to sidewalk or floor construction. The inner form should now be put in place and the walls built.

The inner form is a box with slanting sides, 2 x 8 feet on top and 1 x 7 feet six inches on the bottom (outside dimensions), and should be so placed within the outer form that the space between the forms will be the same on all sides, giving a uniform thickness to the walls of the trough. After the inner form is located correctly, nail several cleats across the top, holding the two forms so that they will not be pushed out of place when the concrete is deposited.

Fill the space between the forms with concrete, depositing it in eight-inch layers and tamping thoroughly. When the concrete is within two inches of the top, lay the three-eighth inch reinforcing bars in place, then fill to the top and trowel off smooth. Finish the edge all around the trough with a sidewalk edger. This will round off the edges of the trough, giving a finished appear-

ance and lessening the chance of chipping. After the concrete is one day old, or when it will bear the pressure of the thumb, the forms may be removed, being careful not to damage the concrete, which is still quite soft. The whole trough should now be given a thick coat of neat cement of the consistency of rich cream, which should be brushed off thoroughly and smoothed off with a steel trowel. The trough should now be covered with burlap and sprinkled daily to insure uniform curing. The provision for inlet and outlet of water should be made before the concrete is deposited. Two pieces of pipe should be used, each pipe being threaded on both ends, the end to come inside the trough having a flanged fitting, and the other end projecting through the concrete wall of the trough to receive a pipe fitting. Holes of the proper size should be bored in the wooden forms, the pipes placed in position, and the concrete deposited around them.

BUILDING CONCRETE IN FREEZING WEATHER.

Concrete built in the usual way and allowed to freeze while it is green, or when just built, before the water has gone out of it, will expand, and in expanding the bond is destroyed. The concrete will crumble away because of the frost having penetrated. About the only way concrete walls can be built in freezing weather is to heat the gravel very hot and use hot water. Then handle concrete quickly, putting it in the moulds while it is still hot. Heat is necessary to have concrete set quickly. By the time the concrete has cooled in the moulds, the cement will have taken its initial set. If concrete has been mixed thoroughly moist, but not sloppy, there will be very little if any excess of moisture in the walls. Therefore, the frost will not injure them. Concrete walls have been successfully built in freezing weather in the above way. Salt is sometimes used in the concrete, to prevent it freezing.

KEEPING WATER OUT OF CELLAR.

It is utterly impossible to have a dry cellar on flat land on a clay sub-soil without drainage. One of the best methods of draining a cellar is to dig a trench where the foundation is to be laid, put in the bottom of this trench some six inches of stone or gravel, and on this lay the foundation. The drainage should be to one corner, and all that is then necessary is to lay tile drain from there to the outlet.

Where much water is present, tile should be laid eighteen inches or two feet beneath the cellar floor. Tile drain led directly through the cellar at that depth and carried to a proper outlet will drain almost any cellar; in fact, every cellar except when there is a natural spring in it. Some people may doubt the correctness of this, but if they will study for a moment and consider that water always rises up from below in a drain or in a cellar, and that this is caused by the pressure of the water outside, they will see the correctness of the philosophy.

As a further precaution, the floor should be laid with concrete two inches thick mixed eight parts gravel to one part cement. Cover floor when set with tar paper, applying hot tar with a broom on top of paper and up on side wall to high watermark. Put top coat on two inches thick, mixed two parts fine gravel or coarse sand. The paper and tar is called a damping course and is the only sure way to prevent water or dampness coming up through floor.

If water comes through both walls and floor of houses already built, the only remedy is to coal tar the wall, preferably on the outside. Put coal tar on old floor, and then lay a two inch concrete floor on top of coal tar, care being taken to join coal tar to walls when tarring the floor. Apply coal tar hot and have walls and floor dry and clean when using same.

BUILDING CONCRETE WALLS.

In most cases, concrete is preferable to stone for foundations of houses and barns, on account of the lower cost and greater resistance to frost. A footing course must first be built; that is, a base wider than the wall it supports, and deep enough in the ground to be beyond frost, which in northern climates will be from three and one-half to four feet below ground level. It should be six inches thick, and extend about the same distance each side of the wall. Care must be taken to see that the foundation is on compact soil that does not yield. When the soil is unsuitable, excavate until rock or other solid material is found, fill up to frost line with gravel well rammed in. Cellar or basement walls must withstand the earth pressure that comes upon them. A foundation extending eight feet below ground level requires a wall fifteen inches thick at the bottom and ten inches thick at the top.

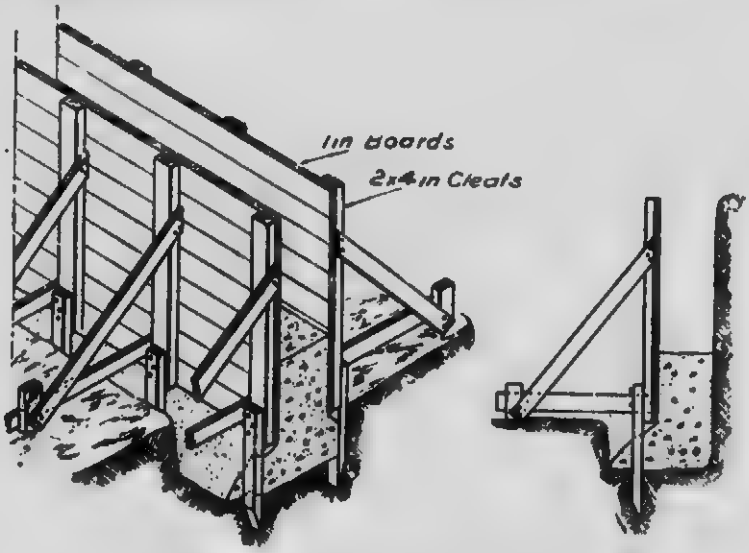


FIG. 1. FORMS FOR CONSTRUCTION OF BASEMENT WALL.

Fig. 1 shows the arrangement of forms for cellar or foundation wall. Nail two planks together lengthwise like a trough, and stand them on end for the four outside corners, and for the inside angles use two-inch by four-inch scantling. Wire or bolt these forms together at the bottom, and nail strips at the top to keep them from spreading, and brace the outside planks to stakes in the ground to keep them plumb. The forms for the sides are supported by upright scantling, every five or six feet, both inside and outside, and opposite each other. Braces made of two-inch by four-inch scantling are attached to the studs. The boards of the form do not extend to the bottom, and the concrete flows out on either side, making a spread footing. In the smaller diagram to the right, the bank of earth serves as one side of the form. This condition may occur when the soil is of a clayey nature and does not cave in, or where the new wall is being built against an old one.

Concrete walls above the cellar may be built either as a single solid wall or as two walls with an air space between them. The air space renders the building less subject to changes of temperature and almost moisture-proof, but is more expensive.

Fig. 2 shows design of wall forms for building a solid wall of any height. The form sections are each made two feet high, and the length depends on the length of the boards at hand. A two-foot section made of inch boards ten feet long weighs fifty-five pounds, which can be easily handled by one man. The cleats are made to lap over the top of the form one and one-half to two inches, in order to catch the next section placed on top of the one just filled with concrete. Use bolts for holding the forms together, and have them greased so that they can be readily removed. After completing the wall, the bolt holes can be filled with mortar mixed in the same proportion as the cement.

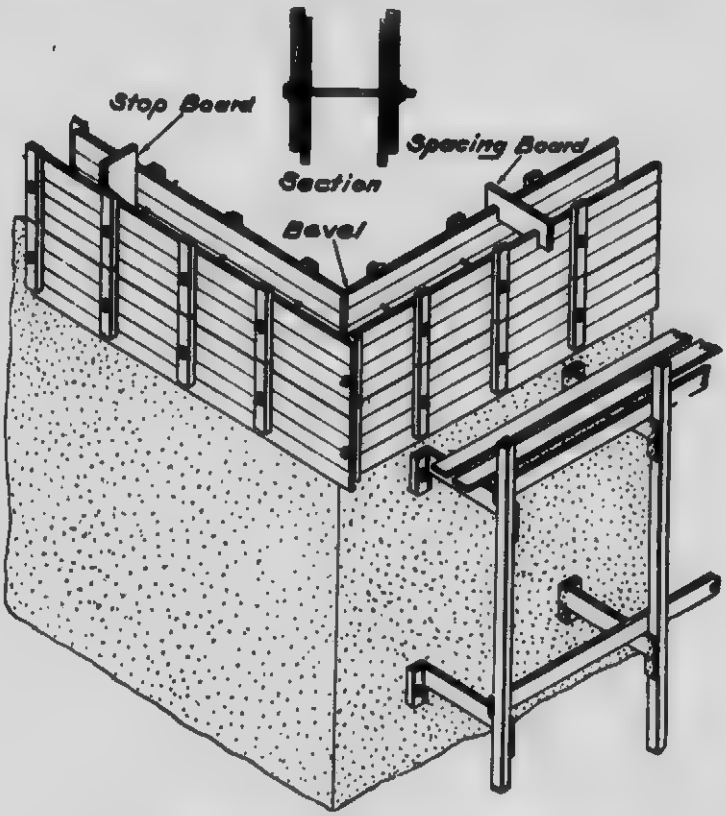


FIG. 2. FORMS FOR CONSTRUCTION OF UPPER WALL.

Walls six inches in thickness should be reinforced with vertical rods one-quarter of an inch in diameter placed eighteen inches apart, and with horizontal rods one-quarter of an inch in diameter placed twelve inches apart. Additional rods must be placed at corners and diagonally across the corners of all openings Walls of small buildings, such as hen-houses, may be made four inches thick with the same reinforcement.

PROTECTION OF WATER PIPE FROM FROST.

In case a water pipe is larger than one inch and the water can be permitted to run continuously at full head during cold weather, and if the main can be protected under a foot of earth, it might be practicable to insulate the pipe so as to make it safe, but insulation will be very expensive. Cylindrical wood

insulators with walls two inches thick and surrounded by a layer of sawdust and asphalt, are manufactured and used for protecting steam and hot-water conduits where heat is distributed from central heating plants. Such an insulator, laid a foot below the surface, with water entering the pipe at 40 degrees and flowing continuously, so as not to be in the pipe more than ten minutes, would be likely to keep the pipe above freezing.

A much cheaper insulation might be improvised, but the difficulty lies in getting one that will have any considerable permanence. A cheaper insulator than that described could probably be made by cutting asbestos paper in strips wide enough to wrap three or four times around the pipe, following this with strips of water-proof building paper wide enough to make three or four turns about the pipe, wiring the whole with ties of galvanized-iron wire.

Another method would be to make a casing out of cheap inch lumber, using six and eight inch boards, supporting the pipe in the centre, filling the casing, before the top board is nailed in place, with sawdust saturated with liquid coal tar to prevent decay.

MIXING MORTAR.

In mixing mortar for a stone wall first make a box, say three feet wide, ten or twelve feet long, and ten inches deep with tight bottom. Take about three bushels and one-half of lime, throw into box, spread over bottom evenly and add water, covering the lime, stirring lime occasionally with a hoe to keep the lime from burning. Keep enough water on lime so that it is thoroughly wet when slaked into a thin putty. Add about one yard of sharp sand and mix thoroughly with hoe. The sand is added a little at a time so as to make the mixing easier. This method is better than the old way of putting lime in the sand pile and covering with sand, then throwing water on lime, as it almost invariably will burn the lime and the small white particles will be seen in the mortar which are not seen when the lime is thoroughly slaked in box above mentioned.

STONING UP A WELL.

To stone up a well with field stone, all that is necessary is to build the wall so that each stone binds or rests against another. When the course of stone is laid, the last stone or key will be put in tight. Choose a stone that will fit the place neatly. Fill in all places between and around stones with small stone. Change the starting place and keying place every course. If the well is kept in a circle and not allowed to have flat spots in it, that is, not allowed to get off the circle, and the stones are well wedged, or filled in, there is no danger of caving, as each course forms an arch, and any pressure from bank will tighten the stones all the more. Any field stone that one man can lift and place in the wall is suitable, but small stones are necessary for filling in between and around the larger ones. The average well is from three to four feet in diameter inside of stone wall, walls usually about eighteen inches thick.

FIREPROOF ROOFING PAINT.

An excellent fireproof paint for a shingle roof is red iron oxide with boiled linseed oil for the first coat, finished with a second coat of raw oil. This is a dark brown color, and the most durable of all kinds of paint, as the oil and iron oxide make a chemical combination which is absorbed by the wood or unites with a metal roof. The quantity needed is based on the fact that one gallon of the thin first coat will cover four hundred square feet, and the second heavier

coat will require a gallon for two hundred and fifty square feet. If the roof is of shingles, it is desirable to paint these on both sides before they are laid on the roof; they will last twice as long as if painted only on one side after the roof is laid. A quick way of painting the shingles is to dip them in the mixed paint, setting them in a trough to drain, thus saving the excess of paint that is not absorbed by the wood.

A TAR AND GRAVEL ROOF.

To make a good tar and gravel roof, first have the roof sheeted with matched lumber; then put on two sheets of tar paper commencing at the lower edge of roof, then another sheet, and so on, allowing the layers to lap over each other like shingles making them three ply. If the paper is three feet wide, then every tier of paper should be laid say eleven inches to the weather. The lower edge of the paper should have a coat of tar extending ten inches up, and the tar paper laid and nailed down in this. After the tar paper is put on, a coat of hot tar is spread over it with a broom and clear gravel sifted into it while the tar is soft, so that the gravel will become imbedded into it.

STAINING AND FINISHING WOOD.

To bring out the pretty natural effects of the grain of different woods, the stain must be applied directly to the bare wood. Filling or dressing the wood with any mixture before staining will surely spoil the beauty of the wood. Nearly all imitations of different woods made by staining by house painters are made from the following colors: Raw and burnt umbers, raw and burnt sienna, Vandyke brown and rose pink. By combining the above colors, nearly all kinds of imitations of natural woods can be made. For instance, oaks light and dark can be imitated with raw sienna and burnt umber, varying the amount of umber as it is wanted, light or dark. Cherry color is obtained with burnt sienna and raw sienna; mahogany with burnt sienna, rose pink and Vandyke brown; walnut, nearly all burnt umber, sometimes a little burnt sienna, if wanted a little more of a red cast. Mix these colors thin. Some colors will stand a gallon of thinness to one pound color, equal parts raw oil and turpentine and a pint of Japan drier to the gallon. By mixing small quantities of these colors and blending them together, it will be possible to strike the color wanted. When stain is applied and dry, give a coat of shellac. When shellac is dry, sand paper smooth, and give a good coat of varnish. If varnish gives too much gloss, use a prepared wax, such as floor wax, which can be had at a hardware or paint supply store and used as directed on can. Do not use dry colors for stain, but get pound cans that have been ground in oil, which are ground much finer than dry colors. It is always wise to experiment on a small piece of wood before doing a large permanent job.

STAINING A FLOOR.

Provided the floor is smooth and clean, staining is preferable to painting, as the stain which soaks into the wood wears well and is very attractive. A very satisfactory staining material is a weak solution of permanganate of potash. This when first applied produces a wine color, but on exposure to the air quickly oxidizes, becoming a rich oak shade. In preparing the stain the permanganate of potash should be dissolved in water and diluted, and a little of it applied with a brush to a piece of smooth board of the same material as the floor; this should be allowed to stand exposed to the air for half-an-hour; if the color is too dark,

the stain must be further diluted with water until the desired shade is produced. The floor should be made very clean and dry, soiled places being sand-papered. One application of the stain should be given, and when thoroughly dry, a coat of shellac and one or two coats of good floor varnish should be given. This will protect the stain, leaving a beautiful surface in which the natural grain of the wood may be seen.

TO FILL CRACKS AND KNOT HOLES.

To fill cracks and knot holes in a floor, make a paste of one pound of flour, three quarts of water, and a tablespoonful of alum mixed thoroughly and boiled Soak small pieces of newspaper in the mixture till it is as thick as putty. Then force into the cleaned cracks with a knife, and it will harden like wood.

DURABLE WHITEWASH.

An excellent whitewash, which is very durable, is made as follows: Slake half a bushel of lime with boiling water, covering the vessel during the process to keep in the steam. Strain the liquid through a fine sieve, and add eight quarts of salt previously dissolved in warm water, two and a half pounds of ground rice boiled to a thin paste and stirred in boiling hot, half a pound powdered Spanish whiting, and one pound of clean glue which has been previously dissolved by soaking it well, and then put the whole mixture in a small kettle within a large one filled with water, and hang over a slow fire. Add five gallons of hot water to the mixture, stir it well, and let it stand for a few days covered from the dust. It should be put on quite hot, and for this purpose it should be kept in a boiler over a portable furnace. It answers as well as oil paint for wood, brick or stone, and is much cheaper. Coloring matter, with the exception of green, may be added, and the paint made of any desired shade.

KALSOMINE.

Prepared kalsomine can be readily purchased at any large paint store, but if one wishes to prepare his own kalsomine, the following rules will enable him to do so. Soak one pound of white glue over night, then dissolve it in boiling water and add 20 pounds of Paris white, diluting with water until the mixture is of the consistency of rich milk. To this any tint can be given that is desired. Lilac.—Add to the kalsomine two parts of Prussian blue and one part of vermilion, stirring the mixture thoroughly and taking care to avoid too high a colour. Brown—Burnt umber. Gray—Raw umber, with a trifling amount of lamp-black. Rose—Three parts of vermilion and one part of red lead, added in very small quantities until a delicate shade is produced. Lavender—Make a light blue and tint it slightly with vermilion. Straw—Chrome yellow with a touch of Spanish brown. Buff—Two parts of spruce or Indian yellow, and one part of burnt sienna. Blue—A small quantity of Prussian blue will give a soft azure tint. Dark blue is never desirable. Delicate tints in the foregoing varieties of colors are always agreeable and tasteful, and so great care must be taken that they are not too vivid. The tints will always appear brighter than in the kalsomine pot, and this fact must be kept in mind when adding the coloring powders.

FENCE PAINT.

A good cheap paint for outside work is made from forty pounds whiting, five pounds glue, twelve pounds and one-half white lead and one-half gallon raw linseed oil. Boil the glue in double kettle until all the water is gone. Mix

white lead and oil to a thin paint. Have the whiting dissolved in ten gallons of boiling water. Stir white lead paint into the boiling glue off the stove, and stir whiting mixture and glue mixture very slowly together while hot. If too thick when cold, add more water. Stir every time a kettleful is taken out before using. To secure cream color add yellow ochre, and for pink add Venetian red; for terra cotta add red and black; for drabs and grey add lampblack and sometimes a little yellow. Mix the lampblack in strong lye or potash water before adding to the mixture.

DIGGING A WELL IN QUICKSAND.

In digging a well through quicksand a tile or crib may be used if the thickness of the sand substratum is not great. The crib is put in place as soon as the quicksand is struck and it settles down into the excavation as the sand is removed. If necessary additional cribs should be placed above the first one. If there is much water during excavation, the sand pump may be used, the crib falling as the pumping proceeds. If there is a continuous sandstratum down to the water-bearing stratum, then the most economical way of reaching it through the quicksand would be by means of sand points driven down, or if that is not possible through the quicksand, it will be found that drilling would work, the iron case which is laid down during the process of drilling providing the crib.

SWEATING OF STOVEPIPE.

The dark colored liquid that drips from the joints of a stovepipe when the fire is started is the tar, etc., contained in the wood. The heat not being strong enough to consume these matters, they are distilled off in the form of smoke, and in coming in contact with the cold stovepipe are condensed into liquid form. The trouble is often due to the stovepipe being too long or to its having too many elbows. When this is the case, the remedy is to alter the position of the stove so that the pipe is shorter and straighter. A correspondent gives the following remedy:

"A tinsmith that I consulted told me he could stop the leaking without changing the pipes. He took a length of stovepipe and cut a hole in it six inches deep and five inches wide; then he took another length, cut it down to nine inches long, cut a hole in it the same size as the first, made the second stove length large enough to go over the first, and put a handle on it (mine has one handle, but it would be better with two). He put two flanges in the first pipe to keep the outside one from slipping up or down. The whole thing is simple enough when you look at it, but it is an effective cure for the trouble complained of. When you shut off the draught the smoke condenses in the stovepipe, and tar leaking all over the floor is the result. When your pipes are provided with this arrangement, all you have to do when the draught is shut is to slide the outside pipe round till you can see in. By doing so you make a draught above the fire, sending the smoke out or up the chimney before it has time to condense."

MEASURING LOGS.

The following is the Doyle Rule for calculating the number of board feet in a saw log: Deduct four inches from the diameter of the log as allowance for slab; square one-quarter of the remainder and multiply the remainder by the length of the log in feet. The result will be the quantity in square feet of one-inch lumber contained in the log.

CAPACITY OF COAL BIN.

A cubic foot of fair anthracite coal weighs 58 to 60 pounds. In order to ascertain how much coal a bin will contain, find its cubic contents in feet by multiplying together its length, width and height, expressed in feet. Then multiply this product by 58 or 60, and the result will be the number of pounds of coal the bin will contain.

CAPACITY OF CISTERNS OR WELLS.

To find the capacity of a circular cistern or well, take the diameter in feet, square this and multiply by .7854 and then multiply by the depth in feet; this gives the number of cubic feet in the well; multiply this by 1,728 and divide by 277, and you will have the number of gallons capacity of the well. If for a square cistern, multiply length by breadth and depth, and proceed to multiply the result by 1,728 and to divide by 277 as before.

TO FIND THE HORSE-POWER OF A WATERFALL.

To find the horse-power of a waterfall, proceed as follows: Multiply the area of the cross section of the water in feet by the velocity in feet per minute, and multiply by 62½, the number of pounds in a cubic foot of water, and this by the vertical fall in feet, and we have the foot-pounds per minute of the fall; dividing by 33,000 gives the horse-power.

Example—A stream flows through a flume ten feet wide, and the depth of the water is four feet; velocity, 150 feet per minute. Then multiply ten by four equals forty, and forty multiplied by 150 equals 6,000, the cubic feet of water flowing per minute, then 6,000 multiplied by 62½ equals 375,000 pounds of water per minute. Now suppose the fall be twelve feet, we have 375,000 multiplied by 12 equals 4,500,000; now divide by 33,000 and we have 133⅓, the horse-power of the fall.

TO ESTIMATE HEIGHT OF TREE.

If it is on open level ground, the easiest way is to measure the length of the shadow cast by the tree. At the same time, measure the length of your own shadow. Then divide the length of the tree's shadow by the length of your own shadow, and multiply by your actual height. The result will be the height of the tree.

As very tall trees are seldom found in open level ground, another method may be adopted. Find a spot some distance from the tree, and on the same level as the ground on which the tree stands. Set up on the spot a pole thirty feet out of the ground and perfectly still, keeping on the same level, until upright. Then walk further back till your line of sight touches the top of the pole and the top of the tree, and drive a peg where you are standing. Now measure the distance from the centre of the bole of the tree to the pole, and to the peg. Multiply the distance from the peg to the tree by twenty-five, and divide by the distance from the peg to the pole. To the result add five feet, and you will have the height of the tree.

Another method may be used in case the tree stands by itself so that one can get a full view of it from a distance of 30 or 50 feet. Choose a spot on the trunk of the tree which is a known distance from the ground (say 4 or 5 feet, gauged by the height of your shoulder, nose or head); then walk backward until you have a good view of the whole tree, and pull down the brim of your hat

until your line of sight is on a level with the chosen mark on the tree trunk. Now take a lead pencil, hold it in line with the mark, and, without moving the pencil, slowly raise your head until the distance between the brim of your hat and the pencil appears to be equal to the space between the pencil and the ground. Then bring the pencil up level with your hat brim and raise your head once more until the distances from hat brim to pencil and from pencil to ground are equal. Continue this to the top of the tree.

To find the height of a tree, let us assume 5 feet to have been the height of the mark on the tree trunk from the ground. Raising your hat an equal distance would have made 10 feet, and another raise would have added 10 feet more, or 20 feet; from that point, suppose the top of the tree appeared to be about 7 feet, then the approximate height of the tree would be about 27 feet. With a good eye for distances and a little practice, you will soon be able to do rapid and fairly accurate work.

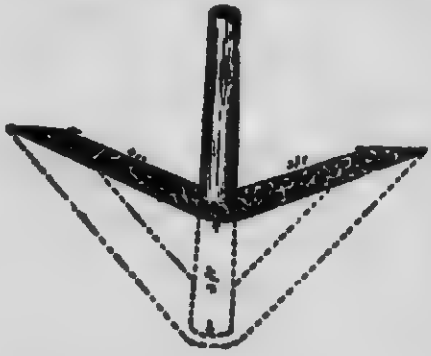
WEIGHT OF ENSILAGE.

It is reckoned that 40 cubic feet of settled ensilage weighs one ton. The following table shows the approximate contents of circular silos:

Diameter.	Height.	Cubic ft.	Tons.
10	20	1,455	30
10	24	1,745	43
12	20	2,160	54
12	24	2,532	63
12	30	3,240	80
16	20	3,840	90
16	24	4,608	115
16	30	5,760	144

CEMENT ANCHORED FENCE POST.

To fix a corner fence post so that it will not yield, dig a right-angled trench the width of a spade, with the two arms pointing in the direction the fence is to run. The trench is three feet deep at the angle and slopes gradually to the surface. Select a good-sized post and set its big end down in the angle of the trench. Fill in the rest of the trench with concrete made by mixing stones with a mortar of three parts good sand to one of cement, ramming the whole well down. Let the post stand for four or five days before stretching the wire.



The illustration shows the depth and form of the trench. The dotted lines represent the bottom of the trench, and the shaded portion shows the surface of the concrete filling.

BLASTING LARGE STONES.

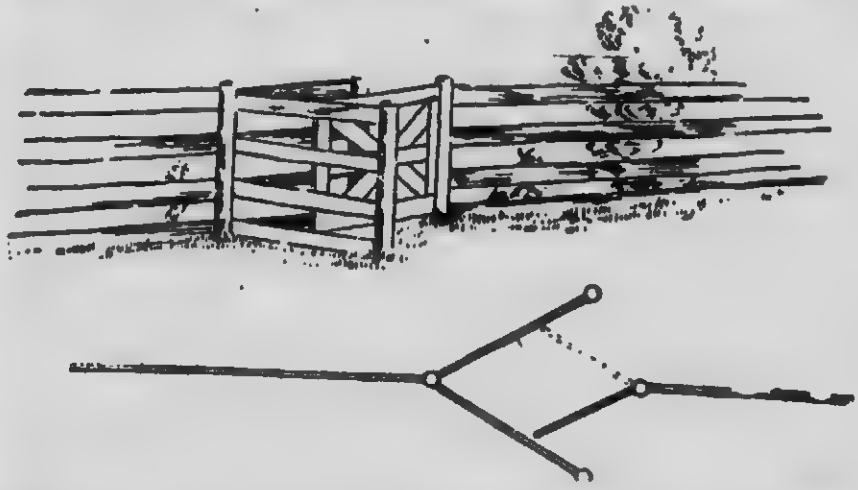
Probably the safest explosive to use in blasting stones on the farm is giant, or blasting, powder. To prepare a stone for blasting, the soil should be removed

from around it, and a hole should be drilled down about half way through it at about the centre of the top. For this purpose steel drills similar to a cold chisel should be used. Three or four sizes of them are needed. The largest, which should be about four-fifths of an inch in diameter, should be about a foot or more in length. Smaller drills, each a little longer, are used to follow the larger one as the hole becomes cramped. These must be kept sharp and well tampered, so as to wear well, and still not break. In drilling, an ordinary blacksmith's hammer is generally used. The drill should be turned a little at each blow and the hole should be kept moist with water. A spoon, with a thin, straight handle and flat bowl about the size of a ten-cent piece, is used to lift out the stone dust as it is made with the drill. When the hole is drilled the desired depth, about two or three inches of giant powder is rammed in by means of a wooden plunger. The fuse is placed in the hole and should reach below the top surface of the powder. The hole should now be filled with powdered brick, which should be well rammed down, care being exercised to avoid breaking the fuse. The fuse should project about a foot outside of the hole to give time for the workman to get well away after igniting before the explosion occurs. The work can be done at any season of the year, but it is seldom undertaken in cold weather.

Where rough wood is plentiful it can be used with advantage in breaking up large stones. The stones should be dug around down to about level with the bottom and a good fire built, which should be continued for an hour or more, or until the stone becomes very hot. If a pail of cold water is now dashed on top of the stone it will break up into pieces that can readily be drawn off with a team.

A GATE THAT IS ALWAYS CLOSED.

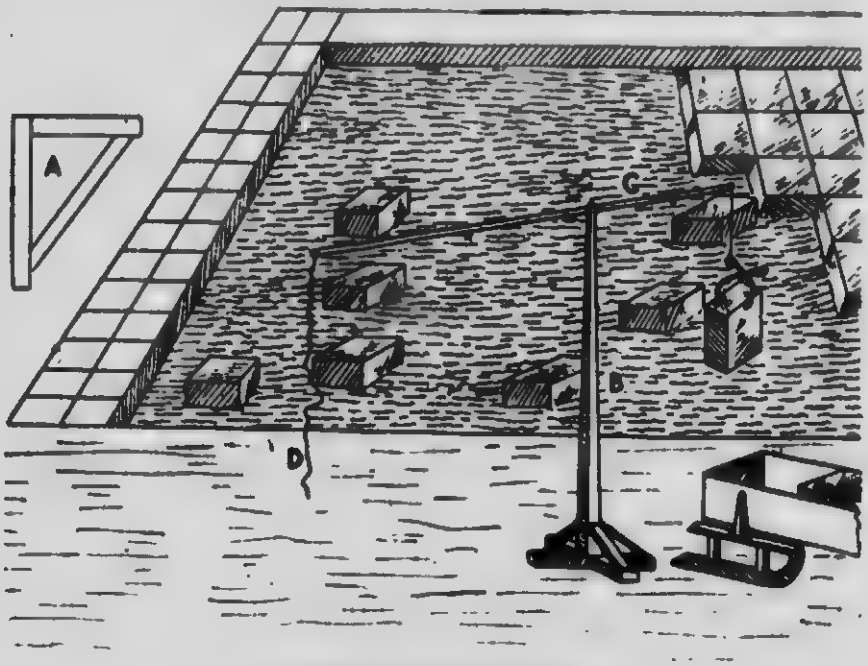
There are places where a common everyday gate is an utter nuisance, and where a turnstile or some other gate substitute or contrivance is particularly convenient and welcome. With the arrangement herewith illustrated, the



gateway is always closed to animals, but a man may pass through it without difficulty. The accompanying drawing will give a clear idea of the plan. The sketch is made to represent a very small gate, but to answer all purposes the wing panels and gate should be a half rod in length.

ICE HARVESTING.

It is dangerous work to pull cakes of ice out of the water, and the larger the blocks the more difficult the job becomes. When it can be arranged, it is well that two or three farmers should go together, so that the same appliances can be used by all. Use a regular cross-cut tooth saw, detaching one handle therefrom. A square can be made of two pieces of narrow fence board (see A in sketch), with a brace to make it rigid. This, with a 16-foot two-inch plank, is used to lay out and mark off the squares of ice. These should be cut as straight up and down as possible, in order to pack closely in the ice-house.



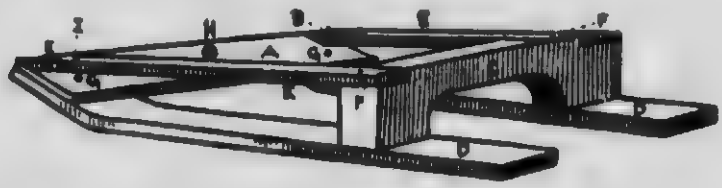
DERRICK FOR HARVESTING ICE.

The illustration explains the manner of using the derrick. Use two strong white oak poles to make the derrick and sweep. The upright B may be cut from any strong piece of lumber, or made up by spiking together two pieces of 2 x 4 studding. It should be 12 to 15 feet long, and braced at the base, as shown in the illustration. The bottom should be smooth, in order to slide freely over the ice. The sweep C should be about 16 feet long, or over, with a rope attached to each end. The sweep is pivoted on top of the upright B. The rope D, at the opposite end, allows plenty of leverage to handle and swing the heavy cakes up and around into the box.

A LOG BOAT.

A convenient boat for drawing logs is shown in the illustration. The runners D. D. are two by six inches, and three and a half feet long. A mortise is made at H for the chain to pass through. The cross piece C is four by seven

inches and three and a half feet long, and worked down to four and a half inches in the middle. Notches are cut into the cross piece four inches wide and two inches deep to receive the scantling E E, two by four inches and three feet long,

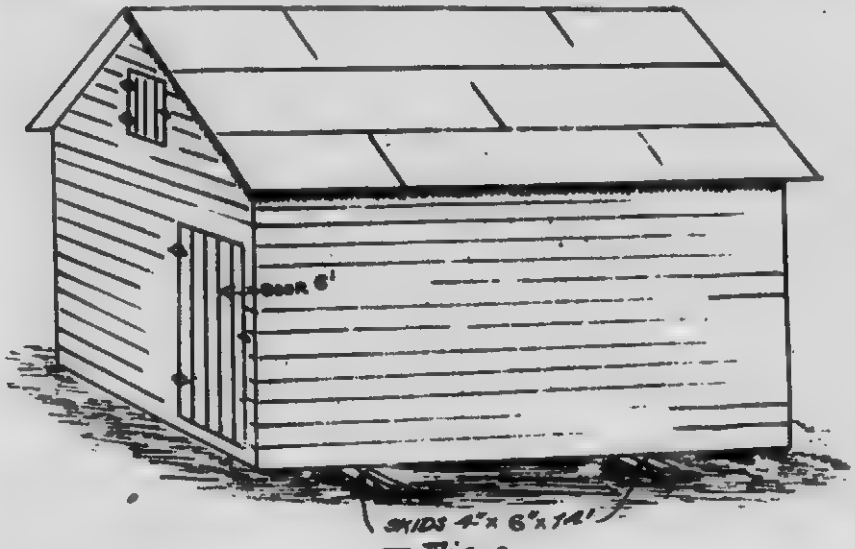


which are fastened down by strong bolts as shown at the dotted lines F F. The two bolts in front B B go through the scantling, plank and runner, while the bolts G G pass only through the plank and runner.

PORTABLE GRANARY.

For portable granaries the thousand bushel size is probably the most convenient.

To contain a thousand bushels a granary should be 12 feet x 14 feet with 8 feet studs. The frame should be made of planks 2 inches x 6 inches fastened by 4 inch spikes 2 inches x 6 inches 14 feet long and 8 pieces 8 feet long, the former for plate and sills, the latter for studs. On two of the 14 feet pieces mark off 2 feet spaces and at these places mark across with a tray square the places where the studs are to be nailed to the plate and upper layer of the sill, but notice that the studs at the ends of the side frames are put flat instead of across;



— Fig. 3. —

OUTSIDE VIEW OF GRANARY.

also that these and all the end studs have a piece cut out to allow the joists at the ends of the building to be let into the end studs. (See A Fig. 1). Then, when the flooring is nailed to these joists, it holds the end wall firm against the

pressure of the wheat. After spiking down through the plate into the studs and up through one plank of the sill into the other end of the studs, the lower plank of the sill may be spiked to the upper plank of the sill. (See Fig. 1). Make the other side frame in the same way, then raise them up and fasten the bottoms together with the two end joists and brace with slant braces in such a position that the side frames are just at right angles to the joists. The tops may then be fastened together by spiking the end plates on top of the side plates. (See B Fig. 1), but first marking on it the places where the end studs are to be spiked two feet apart as before. These end studs are cut similar to the corner ones, except that they must be made 2 inches (or the thickness of the plank) longer than the corner ones, so as to reach the higher plate and fit on the inside of the end joist as before. The other joists may now be laid across and spiked at each end to the side studs, also spiked to the sills.

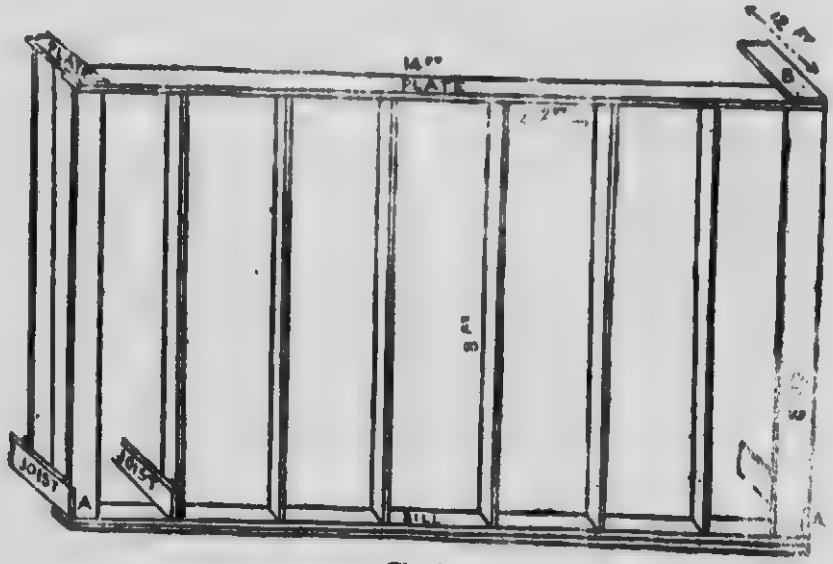


Fig. 1.

Fig. 2.

FRAME OF BUILDING.

The gables are formed by putting up a pair of rafters at each end and spiking to these, upright pieces of 2 inch x 4 inch, scantling resting on the end plate and spiked to it. Two of these should be placed in such a position at each end that a small door wide enough for a man to get through can be cut between them. The elevator spout of the threshing-machine can be put into whichever of these doors is more convenient to allow the machine to be set with the wind. The other rafters may now be raised and braced in position.

Now cut out six feet of one of the end studs to form a door, 4 feet wide, and nail a piece of plank across the top of this space, to form the top of short piece of stud left above. This width of door will allow a fanning mill to be taken in to clean up seed grain, etc.

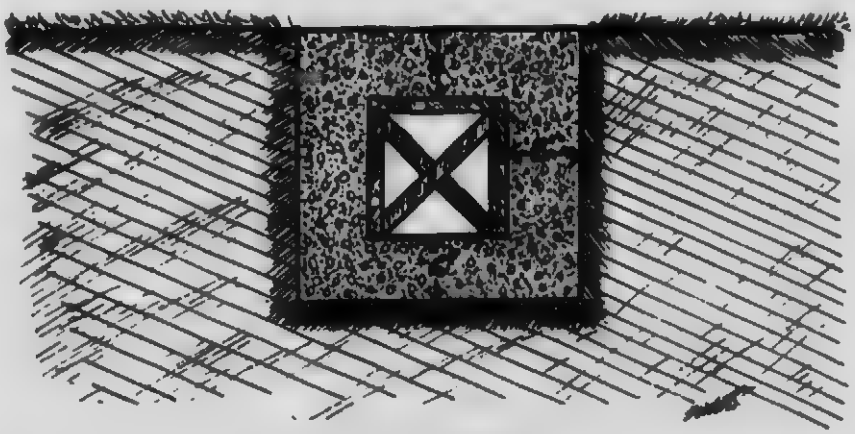
When laying the floor it is a good plan to nail pieces of board on the under side as you go, to cover any knot holes; also nail small pieces of board on the two sides of the studs (3 sides in the end studs) even with the top edge of the joist for the double purpose of supporting the floor and preventing wheat from sifting through the cracks, if you do not make a perfect fit of the flooring round the studs.

To move these granaries make two skids from timber 4 inches x 6 inches, 14 feet long with a block spiked on the back end. Round up the other end like a sleigh runner and bore a hole, into which a large clevis may be fastened. (See Fig. 2). Pry up one end of granary at a time and put the skids in position underneath the granary. Hitch two horses to each clevis by a chain and by tying their heads together as a four horse team for one driver the granary can be moved where you wish. Pry up again and remove the skids. It is a good plan to have two planks fastened together just like the sills to lay under the middle of the joists as a support.

The best material for covering sides and floor is 6 inch flooring, but many people use narrow shiplap. It is also economy to paint as soon as finished. The siding needs to be well nailed with 3 inch wire nails.

A FARM CULVERT.

The accompanying illustration shows a simple and easy way of building a concrete culvert on the farm where a road is needed across a ditch or where surplus water which falls during rains must be conducted across a road to its natural channel.



A SMALL CULVERT.

After the excavation is made, lay a bed of six inches of concrete in the bottom. Then place side and top plank in position the required width and depth and brace them at the ends as shown. Then build in the rest of the concrete, the thickness indicated. When the concrete has set, knock out the braces, pry down the side plank and let the top one fall. They can then all be taken out and put to further use.

If you can get crushed stone, it will make the best concrete. A good mixture is the following:

Portland Cement	1 part
Sand	2 parts
Crushed Stone	4 parts

The crushed stone should go to about an inch in size. If crushed stone cannot be obtained, gravel will do. In that case you will not need sand, as there should be plenty of it in the gravel. The gravel mixture should be:

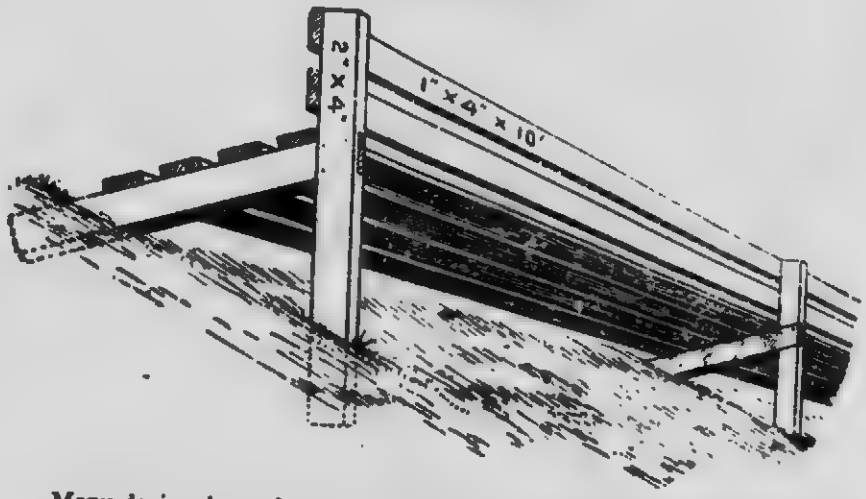
Portland Cement	1 part
Gravel	5 parts

All stone or gravel used in making concrete should be clean and well graded. Cement failures occur most frequently from using materials containing substances that do not bond well.

In making the top surface of the drain shown, it would be a good idea to mix in a few strands of old hay wire and any thin strips of old iron that have outlived their usefulness. They should be laid across the culvert in the concrete and will help to make the structure strong enough to bear the heaviest loads.

The construction of the culvert could be modified by using drain tile of required size in the opening. The tile could then remain in and would form part of the structure.

A SNOW GUARD.



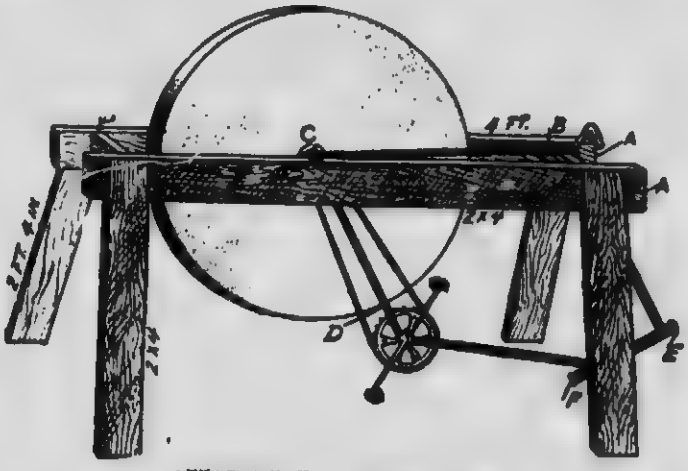
Many devices have, from time to time, been made to obviate the difficulty often occurring where a lane or road passes through a cut, or beside a bank of snow piling up and impeding passage.

One of these devices is illustrated here, which has proved as successful as some more expensive ones, and has the further advantage of being easily constructed. It may be made of any rough material found lying around the farm.

The posts are 2 by 4 scantling, and mortised together as shown. The slats are 4 inches wide, 10 feet long, and of 1-inch material. Any other convenient dimensions answering as well. These "prebenters," as they are called, are placed 15 to 25 feet away from the road on the windward side, so that the slats will be exposed to the wind. The snow is just blown against the slats, and sifts down there, instead of being blown into and filling up the cut or forming a large drift beside the bank.

FOOT POWER FOR GRINDSTONE.

A frame of 2 x 4 is made 4 feet long and 5 inches wide, inside measure. Five-inch blocks are placed 3 inches from ends of 4-foot sides; one being left loose so it can be run through the bicycle frame at seat. A square block, 3½ inches long, is made to fit the hole of stone; a hole is bored in block to receive wheel

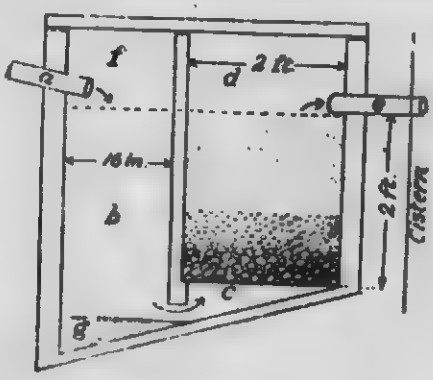


ATTACHMENT FOR OPERATING.

hub; the spokes are removed from rear wheel and hub is cut in two in centre crosswise, and placed in hole of square block in stone and small nails are driven in spokeholes in block. The stone is placed in bicycle frame as before and the frame in turn is placed in 2 x 4 frame; the 5-inch block is run through bicycle frame at seat post, the seat is turned around and the stone is then ready for use.

FILTER FOR CISTERN.

The accompanying diagram shows a simple filter much used, and one that gives good results. The water enters through pipe a, settles in settling chamber b, passes through perforated bottom c, through filtering chamber d, where it is

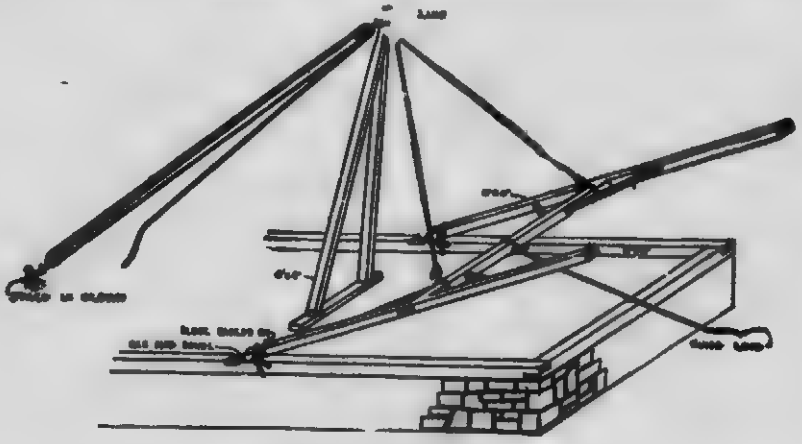


clarified, then out of discharge pipe e to the cistern. The overflow f should be connected to the overflow from cistern. The bottom is inclined so settlement will collect at g. Make the bottom, sides and partition of concrete; proportion

one of cement to two of sand, well tamped to make it as near water-proof as possible. If reinforcing is used. the sides may be three inches and the partition two inches thick. For the filtering chamber get any convenient screen, having an abundance of one-quarter or three-eighths-inch holes, for the perforated bottom. Fasten securely, putting supports under it so weight of filtering matter will not press it down. Next bottom put a four-inch layer of coarse gravel, then fill nearly to bottom of discharge pipe with clean, coarse sand. To clean the filter, stop up discharge pipe e, and pour clean water in filtering chamber d, and pump mud and water out of chamber b. If this is done occasionally, renewal of the sand and gravel is not often necessary. It is best to put a slab of reinforced concrete two inches thick over the top; proportion one cement to three sand. This may be easily taken off for cleaning the filter. Make filter two feet wide; inside measurements given throughout.

DERRICK TO RAISE BARN BENT.

The illustration shows a simple and effective plan for raising barn bents. The derrick is rounded at the top and a heavy iron ring with a hook attached is dropped over the top. The ring is made of ¾ inch wrought iron and is 5 or 6 inches in diameter on the inside. Two strong ropes are attached to the ring as shown. Then, on the opposite side, the double block is hooked. The single block is attached to a stake driven into the ground at the proper distance from the bottom of the derrick.



PLAN OF DERRICK.

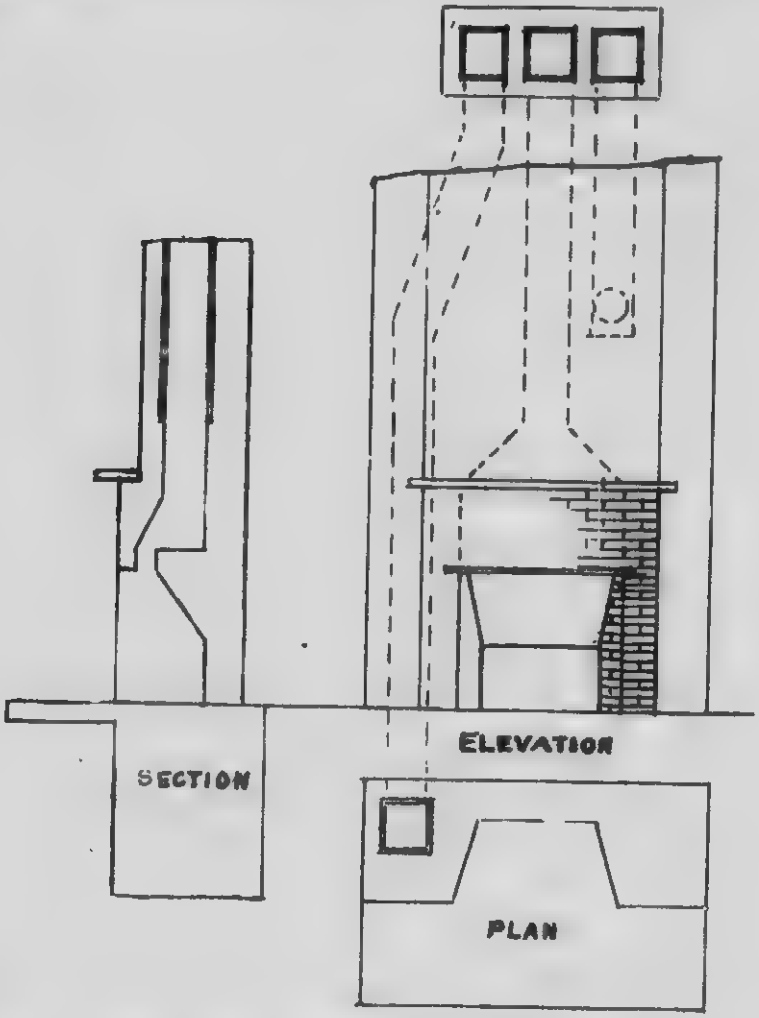
In using this hoist as a puller and lifter, and as the hitch is elevated higher by the rising of the bent until the pull is higher than the derrick, the ring slides off and the pull is direct from the upright timber to the driven stake. The derrick or jack is made of 4-inch by 4-inch timber and made just long enough to raise the block to an angle of 45 degrees. It is desirable to have the ring slip off at about this angle

About a 150 foot length of ¾ inch rope is required for the block and tackle arrangement. The same outfit works well in raising gambrel roof trusses.

Two important points must be remembered: The foot of the bent or truss must be securely fastened before the lifting of the truss begins; also a strong guide rope in competent hands must be ready to prevent pulling the bent too far over.

PLAN OF FIREPLACE.

A fireplace may be built either with concrete or brick specially prepared to stand the heat. The accompanying sketch gives a general idea of how the different parts are arranged. There is provision made for three flues, one for

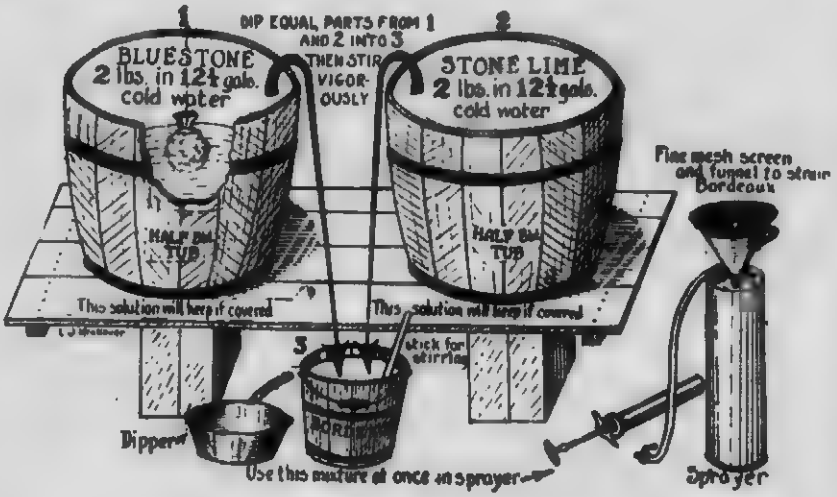


each fire. An average sized fireplace would be about 40 inches wide, 32 inches high and 22 inches deep. The back should be about 28 inches wide and 15 inches high to where it begins to slope forward. The flues are lined with 10-inch glazed pipe. The mantel is four feet six inches in height.

FARM PESTS AND THEIR REMEDIES

SPRAYING MIXTURES

The object of spraying is to control injurious insects and fungous diseases; but, in order to secure the best results, it is necessary to know what these enemies are, and when they are most readily controlled. Most of the injurious insects are furnished with mandibles or biting jaws, by means of which they consume the foliage or stems. In this class are the caterpillars, beetles, grasshoppers cabbage worms, cutworms, maggots, etc To combat these, it is necessary to place upon the food plant some poisonous substance which will not injure the plant, but which, being eaten by the insects, will kill them. The sucking insects form a smaller class, including such pests as plant lice, scale insects, leaf bugs, mosquitoes, etc. They have, instead of mandibles, a beak or tube, by means of which they suck up the juices of the plant. Treatment consists in applying some substance which will kill by mere contact with their bodies, or by suffocating them.



OUTFIT FOR PREPARING BORDEAUX MIXTURE

Fungous diseases, such as apple scab, potato blight, plum rot, etc., are prevented, or kept in check, by the use of a fungicide, the one in most common use being Bordeaux mixture. Where possible, it is recommended that the fungicide mixture be combined with the insecticide, and the two applied together

Both the fungicides and insecticides are usually more effective if applied in a liquid rather than in a dry form, since they adhere to the foliage better *Sprinkling is not Spraying.* The best results are obtained from the use of a fine spray or mist forcibly applied to the foliage; and, so far as possible, it should reach the under side of the leaves. A fine mist is preferable to a coarse spray, as there is much less waste of material, and much less danger of injury to the foliage. A single dash of the mist is better than continued soaking.

For spraying an orchard, the necessary apparatus consists of a force pump, with two lines of hose, nozzles, a barrel or tank for holding the spraying mixture.

and a waggon for carrying all. The pump should be large enough to easily supply two lines of discharge hose, and to develop a pressure of at least sixty pounds to the square inch. It should also have a good agitator. The small bucket pumps and knapsack sprayers do very well for a few trees in the garden, but for field work they are unsatisfactory. All parts of the pump that are subject to wear should be made of brass, and should be carefully adjusted. The pump and all other apparatus should be thoroughly washed every time after using.

The mixtures in most common use, and the methods of preparation, are as follows:

Bordeaux Mixture.—Formula: four pounds copper sulphate (bluestone), four pounds lump lime and forty to fifty gallons water. To prepare with fifty gallons water take a 50-gallon barrel (vinegar or oil) and make two 25-gallon tubs. Put two pounds of bluestone (copper sulphate) in a cloth bag and hang over night in half a tub of water (12½ gallons). Make a lime paste by slaking two pounds of fresh stone lime in the other half tubful. Then follow directions of the picture to make 25 gallons of spray.

Any one of several arsenical compounds may be used along with the Bordeaux to form a combination insecticide and fungicide. The following are among the best:

Paris Green.—Add six to eight ounces to forty gallons of Bordeaux.

Arsenate of Soda.—Boil together for fifteen minutes one pound of white arsenic, four pounds of sal soda, and two gallons of water, until a clear solution is obtained. Add one to one and one-half quarts to forty gallons of Bordeaux.

Arsenate of Lime.—Boil together for forty-five minutes one pound of arsenic, two pounds of fresh lime and one gallon of water. Add one quart of this solution to forty gallons of Bordeaux.

Arsenate of Lead.—Mix two pounds of the commercial arsenate of lead into a smooth paste and add to forty gallons of Bordeaux.

Arsenate of lead is preferable to Paris green as an arsenical spray, for it generally contains less free arsenic, injures the fruit and foliage less, is practically insoluble in water, and, therefore, may be used at almost excessive strengths without serious injury to most foliage. It is very adhesive, and is not as readily washed from the trees as Paris green. Properly prepared, arsenate of lead, owing to its fine particles, remains in suspension longer, and is capable of more uniform distribution.

From three to six sprayings are required for an orchard during the season, the first being given just as the leaf buds are expanding, and the last one in August. The bud moth, apple scab and black rot are controlled by the application made when the leaf buds are expanding. Never spray fruit trees when in bloom. Just after the blossoms fall is the most critical period, as the codling worms, canker worms, tent caterpillars, scab, black rot, curculio and brown rot may then be controlled by an application of Bordeaux and Paris green or Bordeaux and arsenate of lead.

Lime-Sulphur Wash.—This is for application to dormant trees in winter or early spring to destroy scale insects and eggs of aphis. The formula is as follows:

Fresh Stone Lime	20 pounds
Sulphur (flowers)	15 pounds
Water	40 gallons

With warm water make the sulphur into a paste, put in the lime and add about fifteen gallons of warm water with stirring. The sulphur made into a

paste may be added after the lime has been slaked. Boil for an hour and a half in a kettle, or in a barrel with live steam. Make up to forty gallons, strain into spray tank, and apply when warm.

Kerosene Emulsion.—This is particularly valuable against plant lice and scale insects. The formula is: Half a pound of hard soap or a quart of soft soap, one gallon of boiling water (soft) and two gallons of coal oil.

After dissolving the soap in the water, add the coal oil and stir well for five or ten minutes. When properly mixed, it will adhere to glass without oiliness. A syringe or pump will aid much in this work. In using, dilute with from nine to fifteen parts of water.

APPLE APHIS

Several species of aphis, or plant lice, attack the leaves and tender stems of the apple tree. They are very minute, being about one-eighth of an inch long, and varying in color from yellowish-green to dark. Aphis are frequently attended by ants, which are attracted by honey-dew, a sweet secretion from the aphis.

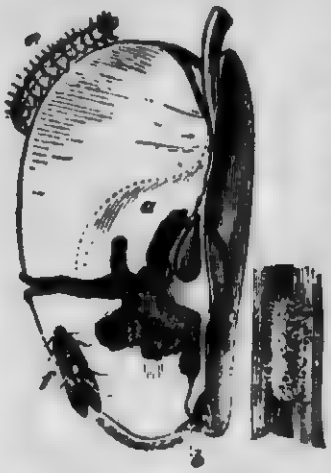
In the growing season the majority of plant lice in a colony are wingless, and during this time they bring forth their living young. At the approach of fall, winged forms appear, and eggs are deposited on the host plants, in which stage the insects pass the winter. The eggs are to be found on the terminal twigs in winter, and in this condition may be distributed with nursery stock. Good results have been obtained from the use of the lime-sulphur wash in the spring, before the buds open. Effective work may also be done in controlling these insects by collecting the clusters on the expanding foliage in the spring. When the leaves become curled up, spraying is more difficult, and repeated applications must be made of kerosene emulsion, whale oil soap, or a strong decoction of tobacco. The natural enemies of these insects are lady-bird beetles, lace-winged flies and small birds, which feed upon the eggs in winter.

APPLE TREE BORERS.

There are two species of larvæ which bore into the trunk of apple trees and when numerous they cause the death of the tree. The mature beetle of both species lay their eggs during the month of June, on the bark of the trunk, and the young larvæ, upon hatching, penetrate into the wood, where they develop in size, tunnelling galleries which increase in diameter as the larvæ become mature. The principal remedy recommended against these insects is the use of alkaline washes on the bark during the month of June to prevent the female beetles from laying their eggs. A good remedy is soft soap, reduced to the consistency of thick paint by the addition of a strong solution of washing soda in water. If applied with a brush about the first of June on the morning of a warm day, this will dry in a few hours, and form a tenacious coating not easily dissolved by rain. If one pint of crude carbolic acid be added to the gallon of wash, it will make it more effective. Later in the year, much good may be done by digging out the larvæ from their burrows by the help of a strong piece of wire.

CODLING MOTH

The codling moth varies somewhat in size, but usually does not exceed three-quarters of an inch in the spread of its wings. Making her appearance in the spring, the female moth lays her eggs on the apple leaves, or on the fruit. Most of the eggs of the first generation are laid on the leaves, and those of the second generation on the fruit. When the larvæ hatch, they enter the apple, either through the blossom end or through the side. It is during the few days between hatching and entering the fruit that spraying must be done to destroy them. Paris green, or an arsenical preparation, applied with the Bordeaux mixture, after the blossoms have fallen, and repeated in ten days, is effective. Cocoons may be observed in holes and cracks in the bark of the tree, in the ground beneath the tree, or concealed under rubbish of any kind that may be near. All these should be destroyed when found. Burlap bands on the trunks will trap many of the insects during July and August.



The larvæ inside the cocoons change into pupæ in about six days from the time of spinning the cocoon. In about twenty days from the spinning of the cocoon, the pupal skin splits and the moth emerges, lays its egg, and gives rise to another generation. Keepings hogs in the orchard to catch the windfalls will doubtless destroy a number of the larvæ, but must not be relied on as a complete safeguard.

TENT CATERPILLARS

Tent caterpillars are widely distributed and destructive to orchards and forest trees. The eggs are deposited on the twigs in ring-like clusters or patches, covered with a layer of light brown, frothy glue, which soon dries, becoming brittle and glistening. Each egg mass contains from one hundred and fifty to two hundred and fifty eggs. In early spring the larvæ appear, and in about two days from hatching begin the formation of their nest, usually in the crotch formed by two twigs near the egg mass. These nests should be removed from the trees as soon as they are noticed, and the caterpillars trampled under foot. Trees that are neglected soon become stripped of their foliage, and where orchard trees are attacked, these soon become weakened and exhausted by having to reproduce foliage at an unseasonable time, so that little or no fruit will be produced the following season. During the autumn and winter, whenever the orchards can be entered, it is a good plan to collect as many as possible of the egg masses. These are fairly conspicuous, and, with a little practice, can easily be detected. They should, of course, be burned. Portions of the orchard where the caterpillars have been destructive are the most likely places for the parent moth to choose for the deposition of her eggs. The caterpillars, of course, can be destroyed by spraying the trees with an arsenical mixture, such as Paris green or arsenate of lead. Orchard trees which are regularly sprayed with the poisoned Bordeaux mixture will be kept free of tent caterpillars, as well as many other leaf-eating kinds of insects.

CUTWORMS

Different kinds of cutworms attack grain crops during the spring, and sometimes eat them bare. They seem to be most numerous where weeds have been allowed possession of the land during the previous autumn. The species which has been most frequently detected feeding upon the small grains is the red-backed cutworm. Two other species, however, when they occur, are much more difficult to reach, because they feed chiefly upon roots, and work almost entirely beneath the surface. They are the glassy cutworm and the yellow-headed cutworm. These are of a dirty whitish color, very similar in general appearance, but the former has a reddish-brown head, and the body is tinged with bluish-green, while the yellow-headed cutworm has a smoky-gray body, and the head and neck-shield are tawny-yellow. The crops most attacked by these cutworms are oats, wheat, corn, and grass in meadows.

The best way to fight these insects is to use the poisoned bran remedy. This may be scattered loosely on the ground among the crop to be protected, or, in the case of climbing cutworms, beneath the trees, where it will be found by the caterpillars and eaten. Another way of using poison is to cut from the edges of fields any weeds or other vegetation, and after tying it up in small bundles, dip these in a mixture of Paris green and water, and distribute them about the ground among the crop. The cutworms will eat these and poison themselves. Trees may be protected by tying small bands of cotton batting around the trunks, which the heavy-bodied cutworms cannot crawl over.

Fall ploughing and spring ploughing are both useful in keeping down some kinds of cutworms, especially those kinds of which the eggs are laid in the autumn, but do not hatch till spring. The ploughing places these so deep in the ground that the small and weak caterpillars cannot work their way to the surface. The keeping down of all weeds in the autumn also prevents the female moths from laying their eggs on such clean land, because the eggs are laid always on plants where the young will find suitable food on hatching.

TURNIP APHIS

The eggs of the turnip and cabbage aphis are deposited in large numbers late in autumn on the old leaves of cabbages and turnips, which, in many instances, are left to rot in the field. When the crop of turnips or cabbages is taken in, it is, therefore, apparent that the tops of turnips and the refuse of a cabbage crop, such as small and imperfect plants, should be either destroyed by being fed to stock, which may be turned into the fields, or, if this is inconvenient, they should be ploughed down deeply, so that these eggs may be got out of the way, or put in such a position that when they hatch in the spring they may not attack a subsequent crop. There is, unfortunately, a general impression among farmers that nothing can be done to prevent injury by this serious pest, but if the early colonies which appear in July and August are attended to when the turnips are thinned and the leaves bearing eggs are fed off or ploughed down, even this enemy may be largely kept in check. The summer treatment consists of spraying the colonies with either kerosene emulsion or whale-oil soap while they are small, at which time they can be easily recognized if looked for.

ROOT MAGGOTS

Very annoying pests are the well-known root maggots of the cabbage and onion, which bore into the roots of the plants, soon reducing them to a rotten mass. The perfect flies of these maggots are very similar to the common house

fly, but are rather smaller. They fly close to the ground and soon after the plants come up, or are set out, lay their white eggs on the stems. In a few days the maggots hatch, and at once begin to work their way down beneath the soil. The cabbage maggot is different from the onion maggot, but the remedies for both are somewhat similar. At the time cabbages or cauliflowers are planted out, a piece of ordinary tarred paper, three inches in diameter, with a slit running to the centre, should be placed around the stem of each and pressed down close to the ground. This will, to a large measure, prevent the flies from laying their eggs on the plants. Another remedy which has given good results is to pour a solution of two ounces of sulphate of iron in a gallon of water around the roots at the time of planting and once a week afterwards for three weeks. A decoction of pyrethrum insect powder, or white hellebore, one ounce in each gallon of water, may also be used in the same way, after pulling away the earth from the stem down to the true roots. For onions the same remedies may be poured along the rows, or dry pyrethrum or hellebore may be dusted along the rows once a week from the time they appear above the ground.

TURNIP FLY.

The turnip flea-beetle, more commonly called turnip fly, is a small, active, shining black beetle with yellow markings on the wing covers. It eats the seed leaves of turnips and other plants of the mustard family directly they appear above ground, and just when they can least withstand such attacks. Notwithstanding its destructiveness, it is an insect which is very easily dealt with indeed. There are two or three broods in a year, and by carefully watching the dates of their appearance, it has been found that a crop of turnips can be sown at such time of the year that no treatment is necessary. Should it be required, however, to sow early, so as to get an early crop, a simple and effective means of protecting the young plants consists of dusting them with a mixture of one pound of Paris green with fifty pounds of air-slaked lime, flour or any other dry powder. Turnips sown after June 12th in Ontario are seldom bothered with the turnip fly.

CABBAGE WORMS.

The most effective and convenient remedy for cabbage worms is a mixture of one pound of pyrethrum insect powder with four of cheap flour mixed well together and allowed to stand for twenty-four hours in a tightly closed vessel. The easiest way to apply the mixture is to puff it over the cabbages with one of the instruments known as insect guns, which are sold by druggists for a few cents. In large areas it will be necessary to use either large bellows made for the purpose and these can be obtained from seedsmen, or to place some of the mixture in a cheesecloth bag, which is then suspended at the end of a stick and lightly tapped with another stick over the plants. This work is best done while the dew is on the plants, as the powder then adheres better to the leaves.

CURRANT WORMS.

The small, green worms that eat the foliage of currant bushes early in the season are the larvæ of the imported currant saw-fly, and, of the enemies to small fruits, there is not one perhaps which is more persistent than this insect. Soon after the leaves expand, early in May, the perfect insects, which are a little larger than a house fly, may be seen flying about beneath gooseberry and currant bushes. The eggs are laid in regular rows along the ribs beneath the

lower leaves, and soon the well-known "currant worms" make their appearance. There are at least two broods in the season. The caterpillars of the first of these appear in May, and, for this first brood only, a weak solution of Paris green (one quarter ounce to a pailful of water is sufficient) may be sprayed on the bushes, or a dry mixture of one ounce of Paris green to six pounds of flour, well mixed together, may be dusted over the bushes after a shower, or when damp with dew. For the second brood of caterpillars, which appears just before the fruit ripens, Paris green must on no account be used, owing to its poisonous nature. Instead of it, use white hellebore, dusted on dry, or in water—one ounce to a pailful of water.

POTATO BUG POISONS

Potato bugs are very easily combatted by the application of poison to the potato vines. The most commonly used poison is Paris green. As soon as bugs appear the vines should be treated with the poison, in either the dry state or mixed with water. If applied dry, the green powder should be very thoroughly mixed with land plaster, very fine ashes, or a cheap grade of flour. The right proportion is about one pound of Paris green and thirty-eight pounds of plaster per acre. It is well to dust it on while the vines are damp with dew. When applied with water, one pound of the poison should be mixed with ninety-six gallons of water per acre. It is well to add one pound of slaked lime to the mixture to prevent the leaves of the potatoes being burned by the Paris green. The solution may be applied with a spraying pump or a watering-can with a finely perforated nose. Second or even third applications may be required, if later crops of bugs appear.

Since the war the price of Paris Green has increased more than treble, and other mixtures have come into general use. Probably the most effective and satisfactory is Arsenate of Lead. This is sold by druggists and seedsmen, both in paste and powder form. A pound package of the paste is dissolved in from ten to twenty gallons of water. A pound of the powder is dissolved in from fiifteen to twenty-five gallons of water. It is claimed for this preparation that it is quite as effective for bugs as Paris Green, and not nearly so dangerous for men or animals; further, that it sticks to the plants better than anything else. It does not wash off very easily with rain, and it is claimed, will not burn the plants. Relative prices quoted are :—Paste, 45 cts; Powder, 75 cts, and Paris Green, 85 cts per pound. The quantities, whether dry or wet, and methods of application are practically the same in all cases. A mixture to combat potato blight at the same time as the bugs, is composed of the Bordeaux Mixture (copper sulphate 4 lbs. and lime, 4 lbs.) together with 4 ounces of Paris Green, or eight ounces Arsenate of Lead in 40 gallons of water. Arsenate of Lime is also used for bugs, but it is not as strong, and possibly washes off more easily.

OYSTER-SHELL BARK-LOUSE.

Although so destructive in all parts of Canada, the oyster-shell bark-louse is not a particularly hard insect to control, where trees are attended to regularly. The first step to take, when an orchard is found to be attacked, is to invigorate the trees by ploughing round them and feeding them with some quick-acting fertilizer, such as well-rotted manure, or a dressing of wood ashes. When trees have been standing in sod, it is well to break this up. Trees which are planted too closely should be pruned and cleaned out, so that they may be easy of access

for spraying and other operations. As soon as winter has set in, the trees should be sprayed thoroughly with a thin lime wash, one pound of lime in each gallon of water. Two coats must be applied, the second immediately after the first is dry. Mild days, of course, should be chosen to do this work. Before very long the lime will begin to flake off the trees and will either carry with it a large number of the scales, or these will be so loosened that they will be washed off or blown away by rain or wind. Where the lime-sulphur and salt wash is used to protect trees against fungous and insect enemies, there will never be any trouble with the oyster-shell bark-louse. The young bark-lice emerge from their mothers' scales during June; the exact date should be watched for, and, immediately the dust-like yellow mites are noticed, the trees should be sprayed without delay with weak kerosene emulsion, or a whale-oil soap solution, using one pound in six gallons of water.

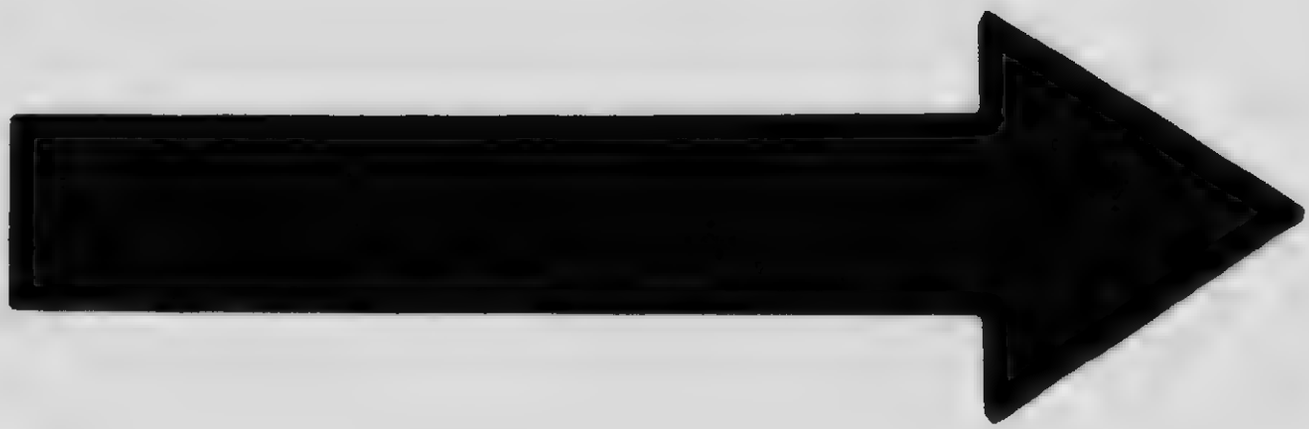
WIREWORMS.

The wireworms which are injurious to farm crops are particularly those which naturally feed upon the roots of grasses and then attack crops which have been sown on sod land. When sod land is ploughed down, the larvæ during the first year feed for the most part on the decaying grass and its roots. Wireworms are the larvæ of click beetles. The eggs are laid in summer about the roots of grasses and weeds, and the larvæ of most species take two years to come to full growth. They change to perfect beetles in the ground in August of the second year; but the beetles, like those of the May beetles, do not emerge until the following spring. When sod land is ploughed down, the decaying grass provides plenty of food for the wireworms during the first year, but in the second year there is nothing but the roots of the crop grown on the land for them to feed upon. It has been found that barley and rye are less attacked than others of the small grains, and also that clover is little injured. Barley and rye, therefore, are better suited as a crop after sod, on account of their immunity and because they mature early. Immediately after harvest the land should be ploughed. Just at this time the wireworms will be changing to pupæ or to the freshly-formed and still soft beetles. Ploughing in August or early in September will destroy many of these. Clover may be sown in spring with either of these grains, and either ploughed down with the stubble in September or left on the land until the following autumn, when the field should be ploughed as soon as there is a good growth after the first cutting. A short rotation, in which land is not left in grass for more than two years, will to a large measure prevent the ravages of wireworms.

HESSIAN FLY.

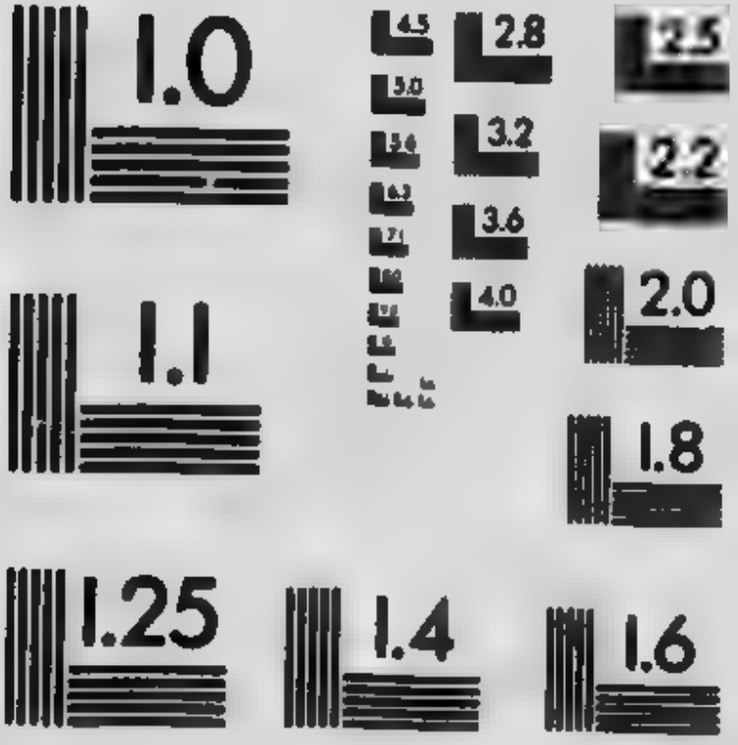
The life history of the Hessian fly must be known before effective treatment can be applied. In the eastern provinces where tall wheat is grown, there are two broods in a year—the flies of the first brood appearing in May and June those of the second in late August and early September. In the western spring-wheat fields, however, there is apparently only a single brood. Instead of the adults emerging in August they remain within their pupa cases on the stubble all through the winter.

In the west, where there is but one brood to be dealt with, probably the best method of dealing with them is to plough the stubble down deeply as soon as convenient after harvest—the object being to bury the pupa cases so far



MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



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below the surface that it will be impossible for the adult flies to emerge. Another good plan is to burn over the stubble of the wheat fields on which the Hessian flies winter over in pupa cases.

In the fall-wheat districts of Alberta, however, there are probably two broods a year, and the remedies that have been found effective in the east will apply there. Late sowing is perhaps the most effective treatment. The plan is to prepare the seed bed as carefully as possible for the crop, and to get the land in good tilth so that the seed may make quick germination and the plants develop a vigorous root-system before the advent of winter. Destroy the dust and screenings at threshing time, and in badly-infested districts burn all the unused straw before spring.

GRASSHOPPERS.

Most of the injurious species of grasshoppers pass the winter in the egg state. The females deposit their eggs in the ground in "pads" or masses of about thirty or more cemented together by a mucous fluid.

The remedies for grasshoppers are (1) the ploughing down of the eggs in autumn or before the young hatch in spring; (2) the destruction of the young before the wings are developed, by ploughing down, poisoning, or by burning in windrows of straw placed as traps for them, and to which they will resort in large numbers at night. (3) catching in implements known as hopper dozers, consisting of a light frame covered with canvas or sheet iron, in the bottom of which some water with a little coal oil on the top is placed; (4) poisoning, a method which has been very satisfactory, either with the poison bran mash, or with the criddle mixture. This latter is made as follows: Take one hundred parts fresh horse droppings, one pound Paris green, and two pounds salt, dissolved in half a pail of water, and mix thoroughly. This mixture is made in a half barrel and drawn on a cart to the edge of an infested field, or one likely to be infested. The mixture is then scattered broadcast along the edge of the crop by means of a trowel or wooden paddle. Locusts are attracted to it from long distances and are killed in large numbers by eating the poison. Should any of the mixture be left over it, it should be scattered loosely over a piece of land where its fertilizing effects will be secured and where there will be no danger of poisoning animals.

SMUT IN GRAIN.

Smut is a disease of grains caused by a minute fungus. There are several kinds of smut, for example, the stinking smut or bunt of wheat, the loose smut of oats, the loose smut of barley, the loose smut of wheat, etc., each confining its attack to its special grain. Stinking smut of wheat differs from the others mentioned in that it does not attack the chaff, but destroys the grain within the hull. The diseased grain is much larger than the normal, and if it is crushed the black dust or spores will be seen to occupy the entire interior. It is this black dust or spores that is responsible for the spread of the disease.

The loose smut of oats, of wheat and of barley, destroys both the grain and the chaff and often leaves the stems nearly naked. All of these smuts, with the exception of the loose smut of wheat, can be successfully treated so that a practically clean crop can be obtained. Seed grain should be treated every year just before sowing. The treatment is as follows: Pile the seed to be treated on a large canvas or clean barn floor and with a common sprinkling can sprinkle the seed with a solution of one pint of formalin to forty gallons of water, at the rate of one gallon per bushel. Shovel over, to ensure the thorough wetting of

every seed. Cover with blanket or canvas for at least four hours, but not more than twelve hours, and then spread out to dry. The object of this treatment is to kill the minute spores that cling to the seed grains, develop with the seedlings, feed within the plants and finally destroy the grain.

Even when grain has been treated as above, the plants may show smut, particularly if the soil is filled with smut spores.

CLUB ROOT OF TURNIPS.

Club root of turnips has been known for more than a hundred years in Europe and is common in certain districts in Canada and the United States on cabbage, cauliflower, radish and some of the mustards. On the root of turnip the disease produces lobed enlargements, while on the cabbage the enlargements are spindle-shaped or finger-like; hence the name, finger-and-toes, given them in England. These abnormal growths are due to the entrance of a low form of fungus, termed a slime-mould, into the root, perhaps, by way of the root-hairs. The cells attacked are stimulated to excessive growth resulting in abnormal enlargements. The fungus eventually produces spores in the affected cells, which are set free in the soil by the decay of the roots. Healthy turnips and cabbage may become infected from these spores in the soil, even after a lapse of two or three years, and manure from stables where club-rooted turnips or cabbages are fed to the stock will infect turnip crops.

The application of about one hundred bushels of lime per acre has been found the best method of prevention. All refuse from a previous crop should be destroyed. Rotation of crops is also advisable.

BLACK ROT OF TOMATO.

The rot of the tomato is due to a fungous disease closely allied to the disease that causes so much damage to potatoes. However, the disease, like potato rot, may be prevented in large measure by spraying with Bordeaux mixture. The affected fruit should be removed as soon as any indication of the presence of the disease is detected. The vines and fruits should then be sprayed with Bordeaux mixture. Wet, cold seasons encourage the development of the disease, while warm, dry seasons discourage it. Vines trained on stakes are less endangered than those which are allowed to grow naturally on the ground.

APPLE SCAB.

The apple scab is due to a fungus which produces the well-known scabby spots upon the fruit, and also attacks leaves and green shoots. To combat the scab, spray thoroughly in spring with dilute Bordeaux mixture, just before the leaf-buds open, or else spray before the leaf-buds begin to swell, with a simple solution of copper sulphate; repeat the application of Bordeaux mixture a little later, just before the blossoms open; spray for the third time just after the blossoms have fallen, adding arsenites for the codling moth, if desired; ten days after this third application, spray again with the combination of Bordeaux mixture and Paris green or other ingredients. Do not apply Bordeaux mixture late to early ripening apples.

APPLE AND PEAR TREE BLIGHT.

The blight which attacks apple and pear trees is bacterial in its nature and for that reason is difficult to treat successfully. It appears to live over the

winter just in the margin of the affected part, near the healthy wood, and not in other parts of the tree or in the soil. The only remedy is to cut out the blighted branches well below the affected part, say one foot below any appearance of blight. The knife used for this purpose should be thoroughly cleaned or sterilized before being again used on healthy wood. It is fortunate that the disease sometimes dies out of its own accord, especially in the case of the body blight. It is thought to be conveyed from tree to tree by bees and insects, which would account for the great increase at blossoming time. The blight appears to develop very rapidly, and the maximum amount of damage is done as soon as the attack becomes noticeable. It will probably be found that the fall is the best time to cut out the affected wood, as the damage will not be much, if any, greater then than in July, and in the fall one may make sure of getting all the blighted portions. As anything which stimulates an undue growth of succulent wood is conducive to blight, it is well to cultivate and manure so as to produce a medium growth of strong, healthy wood.

BLACK KNOT ON PLUM.

Black knot, while a serious disease when once a tree is badly affected, can be eradicated if work is thoroughly done. Three seasons may be required to get the disease well under control. If the tree is only moderately affected, the knots should be removed and burned, and the orchard thoroughly cultivated and sprayed. Vigorous trees are not so subject to the disease as those making little growth, and vigorous trees will recover more quickly from wounds made by removing the knots.

As the early spores appear in the latter part of spring or early in summer, the knots should be removed as soon as possible after they appear. When they are on small branches, these should be cut off three to six inches below the affected part and burned immediately. When this is not practicable without badly injuring the trees, the knots should be removed with a sharp pruning knife and the wound given a thorough painting with pure kerosene, after which it should be covered with grafting wax or lead paint. Great care should be taken to prevent the kerosene running on the branch, as it may injure it. Old knots which cannot be removed with the knife, should get a good painting with kerosene. By putting some coloring material in the kerosene, one can more readily see when a wound has been painted well. All knots should be burned.

Unless the life history of the disease is known, a fruit grower might imagine that if the knots were removed as they appeared that it was all that was necessary. This might be all, if the knots were removed before the spores were formed and distributed, but if one knot were missed it would be capable of producing myriads of spores which would soon re-infect the orchard. A large proportion of the late spores, which are exposed in late winter or early spring and are ready to germinate when conditions are favorable, would be destroyed by an application of sulphate of copper solution at the rate of one pound of sulphate of copper to twenty-five gallons of water, when the trees are still dormant in the spring. A second spraying of poisoned Bordeaux mixture should be made just as, or before, the buds are breaking, which would also be a good time to spray for other diseases of the plum and for insects, and a third spraying should be made at the time when the knots are at the velvety or spore-producing stage, in order to destroy these spores. A fourth application would also probably be well worth the expense. Every precaution should be taken to prevent the spread of this disease, which has destroyed so many plum trees in Canada.

ROT OF PLUMS, PEACHES AND CHERRIES.

Plums, peaches and cherries are affected by a disease, variously called brown rot, soft rot, or gray rot, and technically named Monilia fructigena. This fungous disease affects both wood and fruit. Where a fruit is destroyed the twig to which it is attached is nearly always attacked also. As the fruit rots, part of it falls to the ground, but usually a number of fruits dry up and cling to the twig. These wizened specimens contain millions of spores of the disease, and are largely responsible for carrying it through the winter and spreading it the next season. There are two ways of preventing it. One is by thinning the fruit, so that specimens will not touch each other, and by picking off all diseased plums during the fruiting season. The other is by spraying the trees with ammoniacal copper carbonate solution as the fruit begins to color. This fungicide is obtained by dissolving five ounces of copper carbonate in two quarts of strong ammonia, and diluting this with forty to fifty gallons of water.

PEACH LEAF-CURL.

One of the commonest and, in some parts of the country, most destructive diseases of the peach is that which attacks the foliage early in spring, causing the leaves to curl up and finally drop off. This is due to a fungous disease somewhat closely allied to the disease which causes plum pockets or inflated plums. It is called peach leaf-curl. It is carried over from one season to another by means of minute spores. These find resting places in the bud scales on the young wood. As soon as the leaves begin to develop, they are attacked, and the contortions of the leaves are due to the internal growth of the fungus. The trouble may be prevented by thoroughly disinfecting or spraying the trees with Bordeaux mixture before any growth takes place. This spraying must be done even before the buds swell, and it must be very thorough. Every part of the bud, twig and branch must be coated. Late sprayings are useless, because the parasite does its damage very early in the season, and when the leaves begin to curl, the greater amount of the injury has already taken place. The trees will throw out leaves again later in the season, but the not likely to develop fruit buds for the crop next year.

POTATO BLIGHT.

There are in this country two diseases of potatoes which commonly go under the name of "potato blight," namely the early and the late. The ideal conditions for their development are damp, muggy weather, with a temperature of about 70 degrees. Early blight does not require as favorable conditions for its development as are necessary for late blight. It is a disease which may begin to affect the plants in June or any time thereafter. It is usually most destructive in July and August. The disease appears as brownish spots on the leaves. It usually attacks the ends of the leaves, where the moisture evaporates last, more than it does the other parts of the leaf surface. It is much slower in action than late blight. Weak plants suffer more from its attacks than vigorous ones. The injury it does is undoubtedly greater on late varieties and on late plantings of early varieties than it is on early plantings of late varieties. The latter are often nearly mature by the time this disease becomes serious.

The late blight seldom makes its appearance before August 1, and may appear at any time from then on to the end of the season. When the weather conditions are favorable, it is very rapid in development and very destructive.

A healthy-looking potato field may be destroyed under its attack in the course of only a few days. It begins near the ground and rapidly works upward on the plant. Fields affected emit a peculiar, characteristic odor.

The remedy for both forms of the disease is spraying with Bordeaux mixture. This should begin while the plants are small, an application of twenty-five to thirty-five gallons of Bordeaux mixture per acre being sufficient the first time. The second time the application should be increased to about fifty gallons per acre, and the third and subsequent applications should be at the rate of sixty to seventy-five gallons per acre. Thorough spraying under a pressure of about seventy-five pounds is essential to success. One nozzle per row is sufficient for the first application, after which two nozzles per row will be needed.

The first application for late blight should be made with two nozzles per row, using from sixty to seventy-five gallons per acre, and the same for all subsequent applications. The frequency of spraying should be about every ten days, except in rainy weather, when it should be made more frequently..

LAMB'S QUARTER.

Lamb's quarter is also known as pigweed and white goosefoot. In good soil it may reach a height of six feet, though the usual growth is from two to four feet. Being a gross feeder and a rapid grower, it becomes conspicuous in neglected potato fields, or even in grain fields if it gets the start of the grain. In Eastern Canada infested fields may be seeded to grass for three years or more. An application of the harrow to grain fields before the crop appears above the ground, and again when it is three inches high, will destroy most of the young seedlings. This with periodic summer-fallowing will keep the weed in check. The succulence of lamb's quarter makes it a favorite feeding ground for plant lice and other injurious insects. The seeds are in great numbers and are abundant in commercial seeds and grains.

WILD BARLEY.

Wild barley, with its bristly heads, three or four inches long, is found from Lake Superior westward, particularly in alkaline soils where better grasses will not thrive. It is also known as skunk grass, squirrel tail grass or tickle grass. It is a perennial, and is a serious weed pest, especially to stockmen. The barbed awns cause ulcers and inflammation of the soft tissues of the mouth and teeth of horses and cattle. Sheep are often rendered blind by the action of the awns about the eyes. Its feed value is low. It is not difficult to eradicate from arable land, as June ploughing will usually destroy it. It is quite a difficult matter, however, to deal with it in waste places. Mowing before the seeds are formed is recommended.

CLOVER DODDER.

The dodders are almost leafless plants, which obtain their nourishment by attaching themselves by suckers to clovers or other host plants. Alfalfa and clover seed imported from Europe is likely to contain dodder seeds. The dodder spreads rapidly from a single plant, and destroys the clover in patches. As soon as noticed, the infested spot should be mown, and the refuse removed and destroyed. Fields badly infested should be ploughed before the seed has formed. Clover seed should never be taken from infested fields.

FALSE FLAX.

Like many other pests, false flax has been introduced from Europe. It is now common throughout Canada in waste places and alongside railways. In Western Canada it is often seen in grain grown on stubble land which has not had sufficient cultivation. The remedy is to hand-pull small patches. Prairie soils infested with false flax should receive a thorough disking or shallow ploughing before seeding in the spring. A thorough summer fallowing may be necessary in cases where the plants have been allowed to ripen and fill the soil with their seeds.

STINKWEED.

The well-known stinkweed, also called penny cress and French weed, is an introduced plant, which, when crushed, has a disagreeable smell, hence its common name. It occurs in many places throughout Canada, and in Manitoba and the North-west is one of the worst weeds. It is known to taint the milk of cows which have eaten it, but is not poisonous to stock. It is a very difficult weed to exterminate. Handpulling and burning are the best methods to adopt when the area of land infested is small. Where this is not possible, the land should be cultivated with harrow or other implement to cover what seed may be on the surface and cause it to germinate. Where a field under crop is badly infested, use the disc or harrow as soon as the crop is removed, and in spring, after the weeds have made a new start, plough them under and harrow at once. As soon as there is any growth, cultivate again and continue this treatment through the season, being very particular to leave no weeds alive when winter sets in. Harrowing the growing crop will kil the seedlings of the stinkweed. The harrowing should begin before the grain crop is up and be repeated when the grain is about three inches high. This operation may be repeated the third time if necessary.

HAWKWEEDS.

The yellow devil or branching hawkweed is a most pernicious and aggressive weed resembling closely the devil's paint brush or orange hawkweed, which has given much trouble for several years in Vermont, parts of the Province of Quebec and New Brunswick. Both of these weeds, which are shallow-rooted perennials, spread rapidly, by means of their runners, and mature a large quantity of small winged seeds by means of which they soon overrun land that cannot be ploughed, the abundant and useless foliage taking the place of grass and ruining meadows and pastures. The whole plant is very hairy. The long narrow leaves, three to eight inches long, grow from the roots in large tufts, many lying flat on the ground and choking all other vegetation. As this weed, though a vigorous grower, has all its roots close to the surface of the ground, ploughing down and surface cultivation will kill it in land used for crop. Infested meadows and pastures must be broken up and be put under a short rotation of crops.

WILD OATS.

The best way to clear land of wild oats is to plough in spring and cultivate rather late, then to sow an early variety of barley and cut green for feed. Two cuttings may be got during the summer in most seasons. The wild oats make excellent feed. After the second crop has grown well up, if it is not thick enough to mow a second time, plough the whole down and harrow smooth. The following spring some wild oats will appear from the buried seed. If not convenient to grow roots on this land, sow early to barley, and if the oats are sufficiently

numerous to be dangerous, cut again as hay. It is claimed that wild oats will lie in the land for a long time without germinating, but most of such statements are much exaggerated.

CHESS.

Chess is a winter annual, with fibrous roots and rough, coarse leaves. It has large spikelets, dark green in color, of chatacteristic shape, and grows from three to four feet high. Many look upon chess as degenerated wheat, because it appears among fall wheat that has been winter-killed. This idea is erroneous and without foundation. The fact is, chess will mature seed under adverse conditions, even though the plant be only a few inches high. The seed possesses great vitality, and is often found in wheat and rye.

CANADA THISTLE.

The Canada thistle is the ordinary European field thistle, and is not a native of Canada. It has, however, become thoroughly acclimatized, and has now spread over most of the Northern States and Canada. The statement that Canada thistles can be killed by cutting them at a certain time is a fallacy, although it is a good plan to cut down the plants in summer before the seeds ripen, because the flowering stems are produced at the expense of the reserve material laid up the previous year for that very purpose in the underground stems and rootstocks. If cut when in bloom, a larger amount of this reserve material has been used up, and consequently the plants are in a weaker condition than at any other time of the year, but there is still sufficient material left to produce strong stems, which will produce leaves enough to feed the plants and lay up a store of food for next year's growth.

The best plan to destroy Canada thistles is to mow them down when in flower, and then plough deeply soon afterwards, to tear up as much as possible of the underground stems and roots. As soon as any new growth shows above the surface, destroy this by ploughing again, or with a flat-footed cultivator or disc-harrow, so as to prevent any leaves from forming and laying up food for the plant. It will be well the following year to grow root crops in the fields which have been treated this season to destroy the thistles.

OX-EYE DAISY.

The ox-eye daisy has a thick rootstock, which is perennial in nature, and revels most luxuriantly in old meadows. It cannot stand good, thorough cultivation. Neither fall ploughing nor spring ploughing will kill it. The best course to pursue to get rid of it, and make a permanent job, is to summer fallow thoroughly, using a broad-shared cultivator to cut off the rootstocks and keep them near the surface to dry out and die. Another method is to plant a hoed crop. Good, thorough cultivation such as this would give a good crop, and would thin out the ox-eye daisy roots well. Still another way to treat it is to sow a mixed crop of grain on it, and cut it green for feed, then work up the land well as in a summer fallow. Buckwheat is a good crop to use in subduing the daisies. Cultivate the ground well in spring, and up to July, when the buckwheat may be sown for a crop.

PERENNIAL BINDWEED.

The perennial or field bindweed is in some localities called the morning glory, because of the resemblance of the blossom to the well-known garden flower.

Its stems are slender and twining in habit, forming thick mats on the surface of the ground. The small flowers appear first in June, but continue throughout the summer. A very small portion of the underground rootstock is sufficient to produce a new plant, and hence ordinary cultivation serves to spread the weed. A short rotation of crops shouls be practised, including late-sown roots or other cultivated crops. Rape is suitable for this purpose. Frequent use of a broad-shared cultivator will destroy new growths and exhaust the vitality of the plants. Applications of salt or lime, sometimes recommended to kill this weed, are useless unless applied in large quantities. Small patches may be covered with tar paper to prevent growth for a season, after which there will be few traces left.

LOCO WEED.

The loco weed is very common in some parts of the western prairie country, and ought to be known by sight to every stock farmer. From recent investigations, it would appear that loco weeds are only injurious when they have been grown on soils which contain barium in some form. The loco weed of the western plains is a stiff, upright plant, growing in tufts, with many stems and leaves springing from the same root. It has silvery-downy leaves and erect spikes of creamy-white flowers, each of which is like a small pea flower in shape. There are two color-varieties of the loco weed found on the prairies, the common one mentioned above, with creamy-white flowers, and another with blossoms of a rich reddish purple hue. The leaves of both forms are exactly alike. They are compound, or pinnate, with about seventeen leaflets, eight on each side of the central leaf-stalk and one at the top.

PERENNIAL SOW THISTLE.

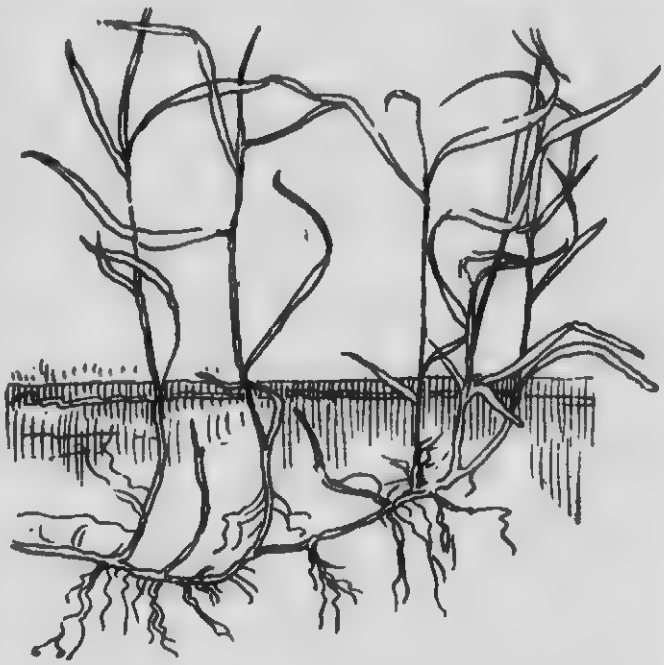
The perennial sow thistle is one of the worst weeds of the farm, as it is extremely difficult to eradicate, and spreads very fast. The plant propagates by means of winged seeds and underground milky rootstocks, which have the power of spreading rapidly through the soil and of sending up leafy branches. Deal with patches individually, and uproot and dig them out by spade and fork, rather than allow them to seed and spread through the remaining fields by the plough and cultivator. Never allow the plants to produce seed, but cut them early in July. If the fields are thoroughly infested, it will be necessary to adopt special methods of cropping and cultivation. Drainage of low land is an efficient means, as sow thistles thrive in such soil. Some farmers have been successful by the method of thorough cultivation with plough or broad shared cultivator, until July, then sowing to rape, in drills which are cultivated and hoed until the rape is in full possession. Any plant that makes an appearance next year can be dealt with by hand. Other farmers summer fallow, then sow buckwheat, followed by corn the following year. Others recommend short rotations of clover—grain—clover. The clover is cut in June and the land ploughed four inches deep and given frequent and thorough cultivation during the rest of the summer. The aim should be to smother the plants by depriving them of light and air. Another method is to plough the land in fall, and the next spring sow to grain with twelve pounds of timothy and eight of red clover per acre. When the land is heavy or clayey, the clover should be five pounds red and two pounds of alsike. Take hay off the second year, and then break up in August and cultivate to destroy weeds until frost. The next year use the land for roots or corn.

RAGWEED.

Common ragweed, known also as Roman wormwood and bitter weed, is an annual which matures a large quantity of seeds, which have great vitality, remaining a long time in the soil without injury. The seed does not mature until late in August and afterwards. In clearing land, an effort should be made to prevent the seed from ripening by cultivating the land immediately after harvest, and late in the year. Early maturing crops should be used whenever possible. When this weed is eaten by cows, it causes bitterness in milk.

COUCH GRASS.

Couch grass is known under various names—quack, scutch, twitch and quitch. On account of its long and underground stems or rootstocks, it becomes very troublesome in rich land. As the roots do not extend more than three or four inches below the surface, the best remedy is to plough infested land just deep enough to bring these to the surface. Leave the land to dry out for a couple of days, then rake thoroughly with a spring-tooth harrow or cultivator to gather up the roots. Gather up these roots at the edge of the field and burn as soon as they are dry enough. A week or ten days later, cross-cultivate again, and if the land is wanted for a late root or field crop, sow by the middle of July. Rape, millet and buckwheat are good cleaning crops for the late sowing. The following year the land may be put under a hoed crop—corn, potatoes or roots.



For Western Canada, the method of ploughing up the couch grass late in the spring, and seeding at once with three bushels of barley to the acre, is recommended.

WILD MUSTARD.

One of the best known weeds of the farm is the wild mustard, otherwise known as charlock or herrick. The stems are from one to three feet high and bear numerous stiff hairs. Propagation is by seeds, which are produced in abundance, each pod containing from fifteen to seventeen. A remedy which has

been found effective against wild mustard is to spray the infested fields of grain with a two per cent. solution of copper sulphate or bluestone (that is, one pound of bluestone for five gallons of water). This operation must be done before the plants are seven or eight inches high. It requires about fifty gallons of the mixture to the acre, and this mixture should be applied on a clear, still day. If a rain should fall within twenty-four hours, or if the weeds are older, a second spraying will be necessary. When the plants are not too abundant, the best method to destroy them is hand pulling, providing this be done before any of the seeds are ripe. In very large fields, or where water is scarce, a far better way than spraying is the use of light harrows or of the implement known under the name of weeder. In this way, not only the seedlings of wild mustard, but those also of many other noxious weeds, are destroyed at the same time, and the growing grain is much benefited by this surface cultivation. Two such weedings should be given between the time the grain is up the time when it has shot up seven or eight inches.

BLADDER CAMPION.

Grass and clover seed often contain as one of the impurities the seeds of the bladder campion, a very persistent perennial weed. Its deep-running root stocks send up many stems, which form tufts. The flowers are white and are set on a much-inflated calyx, which gives the plant its name. This pest has become widely distributed in Eastern Canada, being found on roadsides, in pastures and in hay fields. Besides spreading by the root, it seeds freely, and the seeds are hard to separate from red clover seed. A clover crop in which the bladder campion is prevalent should be cut early for hay, then deeply ploughed and thoroughly fallowed during the rest of the season, preparatory to a hoed crop. A rotation of crops calculated to suppress this weed should allow for a deep and thorough cultivation each spring before seeding and again as soon as the crop is removed. When occasional plants are detected in a field, they can be destroyed by applying a handful of salt to the root after cutting in hot, dry weather.

BLUE WEED.

The blue weed or viper's bugloss is a coarse-growing plant giving trouble in neglected pasture lands and on roadsides. Both leaves and stems are bristly, so that in sheep pastures it causes the wool to become matted. The blue flowers are borne from July to September, the seeds ripening in August or September Continued close-cutting from year to year, when the plant is in early bloom will kill the pest. If prevented from seeding for three consecutive years, there will be few plants left. As it is a biennial, it will be overcome by a short rotation of crops, with fall ploughing and spring cultivation.

DANDELIONS IN LAWN.

The most effective and practical method of clearing a dandelion-infested lawn, other than by hand digging, is by the use of iron sulphate applied as a spray. Professor Longyear, of the Colorado Agricultural College, has succeeded, with three applications, in entirely killing all plants of this common lawn pest without injuring the grass. A portion of a lawn, so badly infested that hardly anything but dandelions was visible, was the following year without a single plant and the grass had thickened a good deal in consequence.

A solution of copperas or iron sulphate, made by dissolving at the rate of one and one-quarter pounds of the salt in a gallon of water, should be applied to the lawn with a spray pump so as to wet every plant. It will not do to use a common sprinkler. The solution must be put on in the form of a fine spray applied with some force to be effective. A common bucket, spray pump, or even a hand atomizer, for very small areas, is suitable, providing it makes a fine, forcible spray. Do not try to hit the dandelions only, but cover every square inch of the lawn. In this way all seedling plants will be killed. Put on a second application in two or three weeks, and a third, and possibly a fourth late in summer if any of the dandelions start into growth. The grass will be blackened for a short time, but soon recovers, and after a watering and mowing will appear a darker green than before. Do not let the solution get on cement or stone walks, as it produces a yellow stain.

TO DESTROY WEEDS ON GRAVEL WALKS.

Several preparations are recommended for destroying grass and weeds on gravel walks, such as (1) carbolic acid, one ounce in a gallon of water; (2) sulphuric acid, one part in thirty of water; (3) arsenite of soda, one pound powdered arsenic and two pounds of soda in ten gallons of water, and, better than any of these (4) common salt; a strong brine made of one pound of salt to every gallon of water. This can be poured over the gravel from a watering can and is far better tion scattering dry salt, because it leaves very little color on the walk.

FIELD MICE.

A safe way of poisoning field mice is to place poisoned food under two boards, each six feet in length and six inches wide, nailed together at the edge so as to make a trough. This should be inverted near the plants to be protected, the poison being put on a shingle near the middle of the run. The mice will resort to these shelters and will eat the poison, which will require renewing from time to time. This has been found very useful by several who have tried it. A good poison mixture which could be used in this way is one part by weight of arsenic mixed with three parts of cornmeal, moistened with slightly sweetened water.

CORN AND CROWS.

About the best treatment to adopt to drive crows away from a newly sown corn field is to sprinkle corn on the ground at several points in the field, and set steel rat traps, covering them very lightly with soil. As the crows are caught, tie them there for a day or two. This will give the crows a wholesome fear of the field and they will give it a wide berth in future.

Another plan is to put the seed into an old pail with one or two small holes in the bottom. Fill it nearly full of corn and then pour in hot water enough to cover the seed. Dip a piece of stick or broom handle for about three inches into ordinary coal tar, or put in two teaspoonfuls of the tar, and stir up the seed briskly so that all of it is moved. By the time the water has run out the seed will be covered with a light film of tar which becomes very liquid in hot water. As soon as the water has run off, turn the corn out on a cloth or paper and dust thoroughly with land plaster, slaked lime, or very fine road dust. This will soon dry the grain, and by the next day it can be planted either by hand or with a corn planter. This treatment does not affect the germination of the seed.

Another plan is to scatter about the corn field a dozen or two of hens' eggs, each containing a small quantity of strychnine. The poison is inserted through

a small hole punched in the shell. Crows are very fond of eggs, and those which come for corn will devour the eggs first. The birds which get a taste of the eggs will not leave the field, but will be left lying on the ground. In a very short time the flock will vacate the field and, warned by the fate of their companions, will not return.

TO GET RID OF RATS.

Various methods are recommended for destroying rats. Trapping, if persistently followed, is one of the most effective methods of getting rid of the pests. The improved modern traps with a wire fall released by a baited trigger and driven by a coiled spring, have marked advantages over the old forms, and many of them may be used at the same time. Those made entirely of metal are the best, as they are less likely to absorb and retain odors. The best bait to use for all kinds of traps is Vienna sausage or bacon. Other excellent baits are oatmeal, toasted cheese, toasted bread (buttered), and sunflower or pumpkin seeds. Poison is often resorted to, but some poisons, such as strychnine, act so rapidly that the animals often die upon the premises, a circumstance which prohibits their use in occupied dwellings. The two poisons most commonly used for rats and mice are arsenic and phosphorus, nearly all commercial preparations containing one or the other as a basis. While experiments prove that rats have great powers of resistance to arsenic, it may sometimes be used as an alternative poison. Preparations of phosphorous sold by druggists are often too weak to be effective; and home-made mixtures, when of sufficient strength, are dangerous, as rats may carry the bait into walls or crannies and thus cause fires.

One of the most effective poisons for rats and mice is barium carbonate, or barytes. Its action on rodents is slow, but reasonably sure and has the further advantage that the animals, before dying, if exit be possible, usually leave the premises in search of water. The poison may be fed in the form of a dough made of one-fifth barytes and four-fifths meal, but a more convenient bait is ordinary oatmeal, with about one-eighth of its bulk barytes, mixed with water into a stiff dough, or the barytes may be spread upon bread and butter, or moistened toast.

The prepared bait should be placed in the rat runs, a small quantity at each place. If a single application of the poison fails to drive all rats from the premises it should be repeated with a change of bait.

Another way to get rid of rats is to use something to which they have a strong dislike. The ordinary caustic potash, or even caustic soda, which is so generally sold as concentrated lye, if placed in the openings of rat holes, will drive away rats for a long time.

ANTS.

A number of species of ants infest houses, the more important of which in this country are the little red ant and the black ant. Neither of these is very destructive to household supplies, but they become a nuisance at times on account of getting into sweet food materials. As soon as a discovery of this sort is made by an ant, the whole colony seems to learn of it within a short time, and the house may become infested with a large number of ants. The black ants nest outside in the earth, and where their nests can be found, in lawns or near the house, the ants may be destroyed by pouring boiling water into the nests or saturating them with coal oil, or by making small holes in the nests with a stick, pouring an ounce or two of bisulphide of carbon into each hole

and quickly closing the holes. As bisulphide of carbon is very inflammable it must be handled carefully and kept away from fire. The small red ants, which at times become almost a plague in some houses, are difficult to trace to their nests, as these are situated in the foundation or in portions of the woodwork that cannot be reached. An efficient method of catching the ants in such cases consists in placing small sponges moistened with sweetened water where they will be found by the ants, and immersing these sponges at intervals in boiling water to destroy the insects. Borax sprinkled across their path will keep them away, and it is claimed that small bags of powdered cloves, or the powder itself dusted on shelves where ants congregate, is very useful in driving them away.

MOSQUITOES.

For keeping mosquitoes from biting in the woods, the following is a good prescription: Oil of almonds, five parts; oil of tar, one part; pennyroyal, one part. This does not smell particularly unpleasant, and if a little is rubbed over exposed parts of the body, it will keep mosquitoes off for about an hour, and after two or three applications, for longer. It washes off easily.

If mosquitoes get into houses, pyrethrum insect powder may be burnt in a bedroom or sitting room. First, close all the windows, and then make a pile of the powder, such as would lie on a silver dollar and heap it up into a cone. Place this on some metal or other hard surface which will not burn, and let it smoulder. The fumes will fill the room and in a very short time stupefy all the mosquitoes. Many of these will recover after four or five hours, when another cone may be ignited.

Small ponds may be cleared entirely of the larvæ of mosquitoes by throwing a few ounces of kerosene on the surface, which will soon spread in every direction o er the water. As the mosquito larvæ, although truly aquatic, must come to the surface at short intervals to breathe, they will be suffocated in a very short time from the oil being on the surface.

BLACK FLIES.

The larvæ of the black flies or midges, develop in water. They inhabit running streams and their early stages are altogether passed under the surface of the water. The only relief in districts where these extremely annoying insects are present is to use some repellent substance. Of these "dopes" there are various sorts. Their basis is usually a cotton-seed, or olive oil, with an admixture of oil of tar, oil of pennyroyal, menthol or some similar volatile oil. Oil of citronella is considered most satisfactory and agreeable. The odor is offensive to some, however, and these may find the menthol preparations more satisfactory. Whatever misture is used, of course, should be applied to those parts of the skin exposed to the flies.

HOUSE FLIES.

It has been proved conclusively that house flies during epidemics of typhoid and other intestinal diseases carry the germs to food which is afterwards eaten by unsuspecting people. Every effort should be used to keep horse stables as free of manure as possible, and great pains should be taken to prevent flies from getting into houses and upon food. The best way to clear flies from a room is to use constantly sticky fly paper or the poisoned fly papers, which are simply soaked in a solution of arsenate of soda with a little sugar added. To use these effectively all of the windows but one should be darkened and the plate containing the poisoned paper should be placed on the windowsill. Flies, wasps and many other insects may be easily killed in a room by putting pyrethrum insect

powder freely about the windows. If the powder is good the flies will be stupefied in a very short time and they must then be swept up and burnt. Some authorities recommend the use of a formaldehyde solution in preference to poisoned or sticky fly paper. The solution is made by adding five or six times the volume of water to some formaldehyde or formalin. A little sugar is added to sweeten the solution, which is exposed in saucers in places where the flies are most abundant. A soap solution made from caustic potash and linseed oil, to which commercial crosol is added, is recommended for the killing of fly larvæ in horse manure.

BEDBUGS.

The difficulty of exterminating bedbugs is increased by the fact that they hide during the day in all sorts of cracks about the walls and floors of the infested rooms and in the furniture, and in such places they lay their eggs. In a new house it is possible to destroy the pest with insect powder, or with benzine sprayed into all cracks and possible hiding places (two applications of benzine at an interval of ten days; no flame should be near), but in an old house fumigation is necessary if the bugs have become once established.

Fumigation with sulphur is effective if only one or a few rooms need treatment. One may proceed as follows: Arrange all articles in the infested rooms so that fumes can circulate freely among them. Remove all tarnishable metals such as brass or silver. Close tightly all windows and all doors, but one for exit. The sulphur is to be placed (about three cupfuls for each room) in an iron pan and burned over an oil stove, or alcohol lamp. The heat of the flame below will ignite the sulphur in the pan, and dense, suffocating fumes will be given off. It is better to have a sheet of zinc beneath the lamp and burning sulphur. The room should be vacated as soon as the fumes appear and left tightly closed for six hours, after which time the windows and doors should be opened. Sulphur fumigation is fatal to the bugs, but the fumes must be dense and the bugs must be under their action for a considerable time.

TREATMENT FOR POTATO SCAB.

Seed potatoes should be treated for scab. Two methods of treatment are recommended—corrosive sublimate and formaldehyde. In the irrigated sections where rhizoctonia is prevalent the corrosive sublimate is recommended. In other sections the formalin treatment may be expected to give equally good results. Scab is very sensitive to soil conditions—particularly acidity and moisture. Scab does its greatest damage in alkaline soil, and is often checked by plowing under of green manure, which increases the acidity of the soil. The following two methods of treating seed are recommended by the department:

Corrosive Sublimate—Potatoes before being cut are to be soaked one-half hour in a solution containing 4 ounces of corrosive sublimate to 30 gallons of water. This can be done in any wooden vessel, such as a barrel or tank. Recent experiments indicate that 30 gallons of solution are sufficient to treat 30 bushels of potatoes.

It must be remembered that corrosive sublimate is very poisonous and treated potatoes must not be eaten nor fed to animals.

Formaldehyde—Potatoes are to be soaked for 2 hours in a solution of 1 pint of formalin (37-40 per cent. formaldehyde) in 30 gallons of water. This solution does not become exhausted as rapidly as does the corrosive sublimate solution and can be employed until the solution is eventually all taken up by the potatoes.

VETERINARY

DISEASES OF HORSES

CARE OF SICK AND DISABLED HORSES.

The result of treatment of horses that are sick or injured in many cases depends as much upon the general care of the patient as upon the medicines administered or applied. In many cases failure to effect a cure is due to carelessness or incompetence on the part of the attendant. In all cases the patient should be made as comfortable as possible by placing him in a roomy, well-ventilated, well-bedded box stall. Good ventilation is in all cases important, but in diseases of the respiratory organs it is essential and often means the difference between success and failure in treatment. Except in cases of injury, when it is necessary to keep the patient as quiet as possible, he should not be tied. Freedom adds to comfort and in cases of painful or spasmodic diseases lessens the danger of injury from halter cast, etc. It allows the patient an opportunity to change positions, to lie with greater comfort, rise with greater ease and be generally more comfortable than when tied even in a box stall. The patient should be clothed according to the weather. Draughts are to be avoided, especially in diseases of the respiratory organs. As stated before, in these cases pure air is essential and while a moderate temperature is desirable, in cold weather it is better to have fresh air and a low temperature than a higher temperature at the expense of the air. In the first case clothing will supply warmth, but there is no satisfactory substitute for fresh air.

The food that sick animals should be given must be regulated by conditions and existing disease. In many cases the patient will not eat, and this is fortunate, especially in most diseases of the digestive organs, except diarrhœa. The groom or attendant is usually too anxious to see the patient eat. There are many cases of digestive troubles that have yielded to treatment with the patient doing nicely in which fatal complications or relapses are caused by the groom (in mistaken kindness) allowing him a full feed. Hence the attendant should not only see that the patient really gets his medicine as prescribed, but must be careful to adhere strictly to orders in regard to food and water. If a man is treating or prescribing treatment for his own horse he should first be satisfied that he understands the disease and its nature, and then see that his instructions are carried out. In most respiratory troubles it is safe to allow the patient a reasonable amount of any food he will eat, but in many of these cases there is a soreness of the throat and it is unsafe to drench, in which cases the medicines should be given in powder form placed well back on the tongue with a spoon, or if necessary to give liquids they should be given with a syringe of not more than two ounces capacity.

In cases of injury the placing of the patient will depend upon the nature and extent of the injury. Mechanical appliances can often be used to give more or less ease. In some cases slings are necessary and in others it is wise to tie and keep as quiet as possible. When freedom is not undesirable the patient should be placed in a box stall as in sickness. The attendant's duty is to dress the required parts with the prescribed dressing at prescribed intervals and feed according to instructions, and at all times keep the patient as comfortable as possible.

ADMINISTERING A DRENCH.

Liquid medicines, when tasteless or palatable to the horse, may be administered by mixing in the drinking water. When they are distasteful, the process of drenching, or of pouring the liquid down the throat is resorted to. The quantity so administered should not be too great, but most medicines should be diluted before being given. For instance, in the case of a prescription of which it is recommended to give a wineglassful, this quantity should be diluted to about a pint with water. The ordinary way is to give it out of a glass bottle, but one made of tin, and flattened is safer. The proper way to administer a drench is as follows: Make a loop on the end of a piece of rope, pass the loop underneath the nose band of the halter and into the mouth, then put the other end of the rope over a beam and pull up the horse's head until it is level. Insert the neck of the bottle in the horse's mouth between the front and back teeth, keeping it up to the roof of the mouth, and giving a little of the drench at a time. Let him swallow it before you give any more, and if he should cough, let down his head and pull it up again, as he may get some of the medicine down the wrong way and set up inflammation of the lungs.

TO PHYSIC A HORSE.

When a horse is to be given physic, he should always be prepared by feeding for forty-eight hours on bran mashes, no hay or oats being given. On the third day give the physic ball, which is made up as follows:—Powdered Barbadoes aloes, six drachms for a small and seven drachms for a large horse; powdered ginger, two drachms; lard, sufficient to make a ball. The horse should be kept on bran mashes till he physics well, then give him hay and gradually get back to the normal feed. When physicking a horse in cold weather, never give cold water; always give it lukewarm, or with the chill taken off.

APPLYING A BLISTER.

The proper way to apply a blister is as follows:—Clip the hair off the part, and then rub in the blister for twenty minutes. As a horse will always try to rub or bite the blistered part, his head should always be tied up for twenty-four hours so that he cannot touch it. After four days, lard the blistered part once a day till the scabs are loosened; then wash off with hot water, into which a tablespoonful of washing soda has been put. If the scabs are not all off, lard again till they are.

VETERINARY MEDICINES.

A few of the most useful and most commonly employed veterinary remedies, together with the doses, are as follows:

Barbadoes Aloes—Purgative—Dose for horse, four to ten drachms; cattle, three-quarter ounce to one ounce. Best kept for horses in capsuled balls, which for administration to cattle can be dissolved in boiling water. Not serviceable as a purgative for cattle except in combination with saline purgatives.

Belladonna, Extract of—Anodyne, anti-spasmodic, narcotic; useful in chill, cough, sore throat, etc. Horse, one-half to one drachm; cattle, one to two drachms.

Linseed Oil—Safe laxative—Horse, one to two pints; cattle, one to two pints.

Magnesia sulphate (Epsom salts)—Time-honored saline purge. Should not be administered to horses, unless in small doses, as an alterative. Cattle, twelve ounces to one and one-half pounds; sheep, four ounces to six ounces.

Opium, tincture of (laudanum)—Narcotic, sedative, anodyne and anti-spasmodic. Useful in colic, superpurgation and "heaving." Horse, one ounce to one and one-half ounces; sheep, two to four drachms.

Potash, nitrate of (saltpetre)—Diuretic and febrifuge. Horse, one to four drachms; cattle, one-half ounce to one ounce; sheep, one to two drachms.

Soda, sulphate of (Glauber's salts)—Saline purgative; action and dose similar to Epsom salts.

Sulphur, sublimed (flowers of sulphur)—Alterative and diaphoretic. Locally parasiticide. Horse, one to two drachms; pigs, one-half ounce to one ounce as a laxative.

Spirit of nitrous ether—(sweet spirits of nitre)—Stimulant, anti-spasmodic and diuretic. Horse, one ounce, one and one-half ounces; sheep, two to six drachms.

Turpentine, oil of—Stimulant, anti-spasmodic, diuretic and vermifuge; useful in colic in horses and "husk" in calves and lambs. Horse, one ounce to three ounces; calves, two to four drachms; sheep, one-half to two drachms.

Zinc, sulphate of (white vitriol)—Astringent; useful in lotions.

Lead acetate (sugar of lead)—Internally, astringent, antiseptic and styptic. Externally, astringent and antiseptic. In full strength, slightly caustic. Sometimes given internally in diarrhœa, or internal hemorrhage. Dose for horses and cattle, one to two drachms. Principally used in solution for external application. One ounce each of acetate of lead and sulphate of zinc mixed with a quart of water constitutes the familiar white lotion so useful in wounds, raw surfaces, sore shoulders or backs, scratches, etc.

Potash, chlorate of—Diuretic and febrifuge and allayer of the irritation of sore throat in cases of influenza or laryngitis, especially in horses. Dose, one to two drachms three times daily.

Chloral hydrate—Anti-spasmodic and anodyne. Very useful in spasmodic or painful diseases, especially those of the digestive organs. Dose, one to one and one-half ounces in solution or capsule.

Nux vomica—Nerve tonic and general bitter tonic. Useful in overcoming partial or complete paralysis of either voluntary or involuntary muscular fibre. Given to overcome paralysis of the coats of the stomach or intestines in cases of constipation or chronic indigestion; partial or complete paralysis of the limbs, etc. Dose for horses and cattle, one to two drachms, three or four times daily.

Iron sulphate (copperas or green vitriol)—Tonic and slightly astringent, vermifuge. Useful in conjunction with vegetable tonics to increase appetite and general tone; often given in conjunction with copper sulphate as a vermifuge. Dose for horses and cattle, one to two drachms.

Copper sulphate (blue vitriol or bluestone)—Tonic, astringent, vermifuge, styptic and checker of mucous discharges, especially chronic nasal discharges. Used much the same as iron sulphate, and is especially useful in nasal gleet. Dose for horses and cattle, one to two drachms. Externally applied in full strength it is caustic, used for the removal of proud flesh, tumors, and other growths, foot rot in sheep, foul in feet of cattle, thrush in horses' feet, etc., etc. In solution of say four drachms to a pint of water it is astringent and antiseptic.

Antimony chloride (butter of antimony)—Caustic. Never given internally. Used for the destruction of warts, proud flesh, tumors, etc. Should be carefully applied with a feather. In cases where it is too strong should be diluted with tincture of myrrh, as if mixed with water it undergoes decomposition.

Nitrate of silver (lunar caustic)—Astringent and styptic. Seldom given internally. Externally, it is caustic, absorbent, or astringent, according to mode of application. In full strength or strong solution, it is caustic. Often used in the form of a pencil for the usual purposes of a caustic, as for the removal of warts, etc. In solution, as five grains to one ounce of distilled water, it is much used as an eye water in cases of opacity of the cornea (those cases where there appears to be a whitish scum over the eye), a few drops being put into the eye twice or three times daily to cause absorption of the exudate.

The vegetable bitters, stomachics and carminatives—gentian, ginger, aniseed, caraways, cascarilla, fenugreek, fennel, etc.—so largely used for horses in powders and in "drinks" for cattle, are given in doses of from one drachm to one ounce, according as several are combined or given alone.

ACUTE INDIGESTION.

Acute indigestion, a malady that is always serious and often fatal, is usually caused by some irregularity in the character of the food, or by greedy swallowing of large quantities of it. The fermentation of foods such as fresh clover, turnip-tops, grass, especially if frosted, and the consequent evolution of gases are potent causes. Sudden changes of food, severe exercise and prolonged fasting frequently bring on an attack of acute indigestion.

The animal is uneasy, pawing with the front feet, lying down, and rolling. A bloating, especially marked on the right side, is soon noticed sometimes accompanied by eructations of gas and attempts at vomition. If even small quantities of ingesta be vomited, this indicates rupture of the stomach, and death follows great prostration. In all cases the pain is constant, but of varying intensity.

Place the animal in a well-bedded box stall and administer two to four ounces of raw linseed oil, or an ounce of hyposulphate of soda in a pint of water. If necessary, repeat the dose every one and a half hours. Foment the abdomen with warm water and give injections of warm water with a little soap. If pain be excessive, give one and a half ounces of chloral hydrate in a pint of warm water as a drench every two hours. If bloating be excessive, it is well to puncture on the right side, but no one but a veterinarian should operate. When the symptoms are not relieved within three hours, professional attendance should be secured.

CHRONIC INDIGESTION.

Chronic indigestion is often brought on by improper feeding and bad conditions. A ravenous feeder, or an animal with bad teeth or a weak stomach may contract chronic indigestion, or it may be caused by the presence of other diseases and by bad water.

The first symptom is a capricious or depraved appetite, the animal at times showing a desire to eat filth. There is sourness of the mouth, and usually increased thirst, the hair becomes dry and erect, the skin scrofulous. The bowels are irregular, a semi-diarrhœa and semi-constipation being present alternately, and there is frequently an escape of gas from the anus. If caused by imperfectly masticated food, evidence will be noticed in the fæces. An hour or two after eating, colicky pains are frequently indicated. In severe cases, there are fits of giddiness and even paralysis.

First, examine the teeth. If, as is often the case in horses under five years of age, there is non-shedding of the molar crowns, these temporary teeth must be removed. Or if any irregularity in the permanent molars irritates the tongue and cheeks, they must be dressed by a veterinarian. If the teeth are in good shape, see that the drinking water is pure and give the animal a change in diet. If not too weak, give him a moderate purgative, say six drachms Barbadoes aloes and two drachms ginger, either shaken up with a pint of cold water and given as a drench, or mixed with sufficient molasses to make it plastic and given as a ball. As in all cases where a horse is to be purged, he should be given bran only for ten or twelve hours before administration. After dosing, bran only should be fed and water with the chill taken off given often, but in small quantities until the purgative commences to act. This should be followed by tonics, as three ounces each of bicarbonate of soda, nux vomica and gentian mixed and made into twelve powders; and one given night and morning in damp fodder, or stirred in a pint of cold water and given as a drench. Feed small quantities of grain at first, and gradually increase as digestion improves.

SPASMODIC COLIC.

This is the most frequent, and at first the most alarming form of indigestion to which horses are subject. But, happily, very few cases terminate fatally. The disease consists in a spasmodic contraction of the muscular coat of a portion of the small intestines, at times involving the large intestines and neck of the bladder. Some horses are particularly subject to these "spasms," and they are usually brought on by a change in food or water, watering when the animal is overheated, or by violent exercise too soon after feeding.

The horse suddenly drops down, kicks and rolls violently, jumps up, paws and goes through many such contortions. Sometimes he makes vain attempts to urinate, leading some to think he is suffering from urinary trouble. The animal becomes quiet again and perhaps commences to eat, but is suddenly attacked again. The frequency and duration of the attacks vary greatly in different cases, but there are always periods of ease alternated by symptoms of pain.

For an ordinary sized horse, say of 1200 pounds, give the following anti-spasmodic drench:—One and a half ounces each of laudanum and sweet spirits of nitre and half an ounce of fluid extract of belladonna in a pint of cold water. Half an ounce of chloral hydrate dissolved in a pint of warm water also makes a good drench. If necessary, repeat the dose in one and a half hours. It is usually well to follow up with a purgative.

FLATULENT COLIC.

Flatulent colic is a much more serious disease than spasmodic colic. Here the worst feature is the distention of the intestines with gas. As in all other acute digestive troubles, the causes are usually changes of food and water, or the giving of feed of a poor quality, especially green fodder that ferments easily. There is often no recognizable cause for the disease, in which cases it is no doubt due to the sluggish condition of the digestive glands. The actions of the animal are not nearly so violent as in spasmodic colic, but severe pain and distress are more evident, the horse pawing and striking at his belly with his hind feet, while the abdomen is more or less distended, especially on the right side. If relief is not soon afforded, the breathing becomes labored, the extremities cold, and death follows from rupture of the intestine, suffocation, or blood poisoning from absorption of gases.

Give two to four ounces of turpentine in a pint of raw linseed oil; repeat in an hour if necessary. Give one and a half ounces chloral hydrate, or two drachms solid extract of belladonna in a pint of water every two hours to relieve the pain. If bloating is excessive, get a veterinarian, as puncturing is necessary. In any case, if relief is not given in two or three hours, a professional man should be secured at once.

ENTERITIS.

Enteritis, or inflammation of the bowels, is one of the most painful and fatal diseases to which horses are subject. Involving first the mucous or lining membrane of the intestines, the inflammation extends till it affects all the coats of the bowels. The disease may terminate favorably or fatally within three or four hours, or it may continue to forty-eight hours and even longer. The causes are somewhat similar to those of other acute intestinal diseases, especially if the condition be aggravated by exposure to cold or draughts.

It is first noticed that the animal is depressed, suffers from rigors, wears an anxious expression, accompanied by rapid breathing and rapid discharge of small quantities of fæces (often semi-fluid). The appetite disappears, the mucous membranes are injected, the mouth dry and hot, the pulse hard, frequent and wiry, and the belly tender upon pressure. The horse shows abdominal pain by striking at the belly with the feet, and stamping. After making frequent attempts he lies down carefully, looks towards his flanks, pants, and sweats profusely. The pain is constant, severe and agonizing. Sometimes the animal stands and paws for hours, or roams aimlessly about the stall apparently blind, striking his head against the walls. The pulse becomes thready or imperceptible and the pupils are dilated and expressive of delirium. If he does not die of exhaustion, gangrene sets in, and the pain ceases. The animal becomes quiet, even drinks a little water, but the haggard expression remains, cold sweats bedew the body, the abdomen swells, the extremities are cold, the breath cold and sometimes fœtid, and he soon falls and expires.

Treatment consists in making the patient as comfortable as possible, and giving large doses of opium, say, two to four drachms pulverized gum opium in half a pint of cold water every two hours as long as necessary. Hot applications, as blankets wrung out of hot water, and applied to the abdomen give great relief.

CONSTIPATION.

The bowels of the horse are naturally somewhat torpid. Constipation of the bowels may be looked upon more as a symptom than as a disease in itself. It is first noticed that the animal is dull and the appetite is impaired, while the fæces are smaller in quantity and drier and darker than usual. There is an absence of the normal intestinal murmur, which, in the healthy horse, can be detected when the ear is placed against the abdomen. In some cases there is a non-contractile condition of the rectum.

First overcome the paralysis of the muscular coats of the intestines by two drachm doses of nux vomica given three times a day, then administer a purgative of one pint of raw linseed oil. Inject warm water with a little soap, and give small quantities of laxative and easily digested food. If weakness becomes marked, administer four to six ounces of whisky in half a pint of cold water every three or four hours. If pain be shown, give a dose of two drachms of solid extract of belladonna or a half ounce of chloral hydrate.

DIARRHŒA.

Diarrhœa is induced by a variety of causes. It may be due to indigestible food, sudden changes from a dry to a wet diet, or it may be caused by parasites, derangement of the liver, impure water, heavy draughts of cold water when the animal is heated, or by foreign matter in the intestines. Some weak, flat-sided, short-ribbed, narrow-loined horses are naturally "washy," and may purge on going a journey.

First, find the cause. If a foreign body in the intestines is suspected, a pint of raw linseed oil will hasten its removal. But if the patient shows well-marked signs of weakness and debility, laxatives should not be given. If laxatives do not check the diarrhœa, or if weakness prohibits their use, one and a half ounces tincture of opium and four drachms each of powdered catechu and prepared chalk should be given as a drench in a pint of cold water every four hours till the diarrhœa ceases. Cold water with one-quarter its bulk of lime water should be given in small quantities, say, a gallon at a time, and often. The food should be dry hay and oats. If the animal is too weak to eat, give four to eight ounces of whisky with raw eggs mixed in the drinking water. Drench him with it if necessary, but he is usually so thirsty that he will drink it.

PNEUMONIA.

Pneumonia or inflammation of the lungs, is caused by exposure, sudden changes of temperature, chills or over-exertion when not in a fit condition. The disease starts with a shivering fit, followed by increase of temperature and a full, bounding pulse. Usually a dry cough and coldness of the extremities is present. The animal stands listlessly, and shows little desire to eat. The breathing is quicker than normal, and if the ear be placed against the chest, peculiar sounds are heard. At first, these are dry and grating, but after a day or two they disappear, and later sounds of a moister character appear. Meanwhile, the animal stands with legs outstretched and nose protruded. After the first stage, the cough becomes moist. If the breath becomes fœtid, the disease will soon prove fatal.

Put the patient in a well-ventilated box stall; exclude all draughts and blanket him well. In the first stages give 10 to 15 drops of Fleming's tincture of aconite in half a pint of cold water every two hours, till the strength of the pulse is reduced. Allow liberal quantities of cold water, with two or three drachms of saltpetre in it, as often as he will drink. Apply blankets wrung out of hot water to the sides, or rub the sides and above the breast well with mustard mixed with oil of turpentine and water. Blanket heavily, and give two ounces of solution of acetate of ammonia in a little cold water as a drench till he perspires freely. Hand rub, and bandage the legs. Remove the mustard in five or six hours, and repeat its application if necessary. Give one-drachm doses of sulphate of quinine every four or five hours. Feed on soft laxative food, and, if pulse becomes very weak, give six or eight ounces of whisky every seven or eight hours. If he will not eat, give milk and eggs. When he starts to recover, give good food and care, and administer drachm doses of sulphate of iron and gentian three times daily. Be careful not to put him to work for a full two weeks after recovery, or he will probably have a fatal relapse.

ACUTE LARYNGITIS.

This is an inflammation of the mucous membrane of the larynx, in which the formation of mucous is apt to close the opening to the windpipe and cause

death by suffocation. The first symptom is a dry cough accompanied by difficulty in swallowing, much of the water returning through the nostrils. The discharge from the nostrils soon becomes thick and purulent, while the animal with nose protruded, shows marked, but variable, difficulty in breathing. The glands of the throat are swollen and tender to pressure, the eyes watery, the appetite is impaired, and the animal is troubled with a cough, sometimes painful and distressing. The legs often become swollen and the joints are, but as in most respiratory diseases, the patient stands the greater part of the time.

As most fevers must run their course, in mild cases good care will suffice. Make the patient comfortable in a roomy, well-ventilated box stall and exclude all draughts. Apply a liniment, composed of equal parts spirits of ammonia, oil of turpentine and raw linseed oil, to the throat twice daily for two or three days. Fasten a woollen cloth around the throat to keep it warm. Give two-drachm doses of chlorate of potash three times daily by placing it well back on the tongue with a spoon. Do not drench, as swallowing is difficult. Steam the nostrils, give soft food, and if he will not eat, give milk, eggs and a little whisky. Hold the pail high for him to drink, and feed from a high manger. If breathing becomes distressful, there is danger of suffocation, and only immediate operation by a veterinarian will save life.

ROARING.

Roaring occurs as a sequel to acute laryngitis. It is caused by the air forcing its way through the greatly reduced passage, a condition due to the chronic thickening of the mucous membrane of the larynx, or to the wasting away of the laryngeal muscles. This wheezing sound may also be due to any obstruction in the large air-tubes, such as growths, in which case the sound is heard both during inspiration and expiration. Roaring is produced usually by more or less severe exercise, being seldom heard when the animal is at ease.

If due to any obstruction, it must, of course, be removed; but if caused by atrophy of the laryngeal muscles (as is usually the case) nothing can be done. In the early stages, benefit may be derived from blistering the throat; or, pads arranged to press upon the nostrils, may prevent too great a volume of air entering and thus reduce the sounds. In cases where an otherwise valuable horse is practically useless, a tube may be inserted in the windpipe. This operation is sometimes performed on race horses.

CATARRH OR COMMON COLD.

Ordinary catarrh or cold in horses is caused by exposure, ill-ventilation, and sudden changes of temperature. Animals are especially liable when shedding their coats, and young horses when first stabled in the fall often suffer from it. If catarrh is neglected, it is liable to extend and involve the whole respiratory tract. The most noticeable symptoms are sneezing, a watery discharge from the nostrils, and redness and dryness of the mucous membrane of the nose. The discharge subsequently becomes thick, whitish and profuse; there is a slight rise in temperature, and the animal becomes dull and loses its appetite.

The patient should be placed in a well-ventilated box stall from which all draughts are excluded, and if cold he should be blanketed. Steam the nostrils over a pail of hot water. Give two or three-drachm doses of saltpetre three times a day in cold water to drink, and feed on laxative food, such as good clover hay, bran and carrots. Do not drench or purge. If bowels are costive, give injections of soap and warm water.

PLEURISY.

Pleurisy is partial or general inflammation of the lining of the chest and covering of the lungs, due to the same causes as other chest affections. The disease usually commences with a chill, coldness of the surface of the body and extremities, succeeded by signs of pain, often mistaken for those of colic. This stage, in which the patient paws, lies down or rolls,—soon passes off and he stands stiffly on outstretched legs; the breathing becomes quicker and mostly abdominal. If made to move, he groans with pain. The cough is short, dry and painful, and the pulse hard and frequent. If the disease be not checked, water in the chest develops and the pulse becomes small and soft. There is an absence of sound in the lower part of the chest, or a sound like dropping water. Swellings sometimes appear along the abdomen and in the legs.

If there is much pain at first, give one and a half ounces of chloral hydrate in a pint of cold water as a drench, and if necessary, repeat the dose in an hour. When the pain ceases, if pulse remains full and strong, give ten to fifteen drops Fleming's tincture of aconite in a little water every two hours until the strength of the pulse is reduced. Apply mustard mixed with turpentine and water to the sides and clothe warmly. Repeat the mustard application in twelve hours if necessary. Give one drachm iodode of potash four times daily. If the pulse becomes weak, give six to eight ounces of whisky in a little water every four or five hours. If there is much effusion in the chest, an operation by a veterinarian will be necessary. When the animal begins to get well give good food and tonics, as drachm doses of sulphate of iron and gentian three times daily.

STRANGLES OR DISTEMPER.

This disease usually attacks young horses, occurs in two forms—"regular strangles" and "irregular strangles." It is a contagious disease, and usually renders the horse immune from further attacks.

The first symptoms are unthriftiness, cough, fever, soreness of the throat and a discharge from the nostrils, at first watery, but later becoming purulent. Swellings or tumors in the region of the throat grow quickly, forming pus and break in a few days. Abscess after abscess may form in any part of the body; if in an internal organ, its existence can only be suspected, and it usually proves fatal.

Make the animal comfortable and give easily-digested food. Steam the nostrils, poultice the throat or apply a liniment composed of equal parts spirits of ammonia, turpentine, and raw linseed oil twice daily until the abscess or abscesses begin to point; then open them and flush the cavity out twice daily with a five per cent. solution of carbolic acid until healed. Meanwhile, give internally three to four drachms hyposulphite of soda three times daily. If he will not eat the powders in his food, place them well back on the tongue with a spoon. The irregular form of strangles requires similar treatment.

HEAVES OR BROKEN WIND.

Heaves is a dietetic disease brought on by neglect and thoughtlessness in feeding large quantities of succulent food, inducing the animal to gorge itself and distend the stomach frequently, especially where palatable food is fed, or unnutritious food is given, as over-ripe timothy or clover hay, badly cured. The best way to prevent it, is to feed a balanced ration. Give only sufficient

quantity to nourish the animal, and never feed to excess. Water frequently and exercise twice a day—two or three hours in the forenoon and the same in the afternoon.

In all cases of broken wind or heaves there is a primary cough known as broken-wind cough, and afterwards a double heaving of the flank during expiration. Before there is a double breathing, and when the cough only exists, or in the early stages of double breathing, there is always an aggravated condition when the animal's stomach is gorged. Then the extreme distention of the stomach affects the nerves supplying the digestive system, which is the cause of heaves. Once established, there is no cure for the disease; but the distressing symptoms may be relieved by proper attention. Water the animal invariably before feeding and never directly after. Feed, largely, carrots, potatoes or turnips and give half a pint of dark molasses with each feed. Three drachms of Fowler's solution of arsenic in each feed will give relief.

CONGESTION OF THE LUNGS.

Congestion of the lungs is due to a weakened condition of the heart, resulting from over-exhaustion or exposure to cold. The animal stands with outstretched limbs, nose protruded, and seems to fight for breath. The nostrils are dilated, flanks heaving, body trembling, legs and ears cold. Cold sweats break out, the pulse is small, indistinct and frequent, and the action of the heart tumultuous.

Place in a comfortable box stall with plenty of fresh air. Bleed to relieve the congestion of the vessels, and, after drawing four or five quarts of blood, give stimulants as six to eight ounces of whisky. Rub the body, clothe warmly but not too heavily, and hand-rub and bandage the legs. Repeat the stimulants every hour or two as long as necessary. If promptly treated, a recovery usually results; otherwise, pneumonia and other complications are liable to occur.

AZOTURIA.

Azoturia affects the kidneys and the organs of locomotion, and is caused by want of exercise and excess of nitrogenous food; or in other words by good feeding and idleness. After a varying period of idleness, a horse is taken out to drive or work; feeling, as a rule, more lively than usual. After going some distance, he suddenly becomes lame on one or both hind legs, sweats profusely, staggers, and sometimes exhibits colicky pains, perhaps struggles and falls, and is unable to rise. There is a tense swelling of the muscles over the loins; the urine is thick and dark. If on his feet, he will try very hard to remain standing.

Keep him on his feet if possible, and get him to the nearest stable. Apply mustard mixed with water and oil of turpentine over his loins, and cover well with blankets. Give two drachms iodide of potash in a pint of warm water as a drench, every four hours for three or four doses. If pain be excessive, give two ounces of chloral hydrate in a pint of warm water. If he falls, and is unable to rise, he must be removed to comfortable quarters. The urine must be drawn off with a catheter every eight hours, and injections of warm, soapy water given per rectum. An attendant should remain with him to keep him as comfortable as possible, by padding up with straw. As he recovers, assist him to rise, if necessary, use slings. As soon as he can walk, give a little exercise and gradually increase the amount, day by day.

LYMPHANGITIS.

Lymphangitis or weed is an inflammation of the lymphatic glands, affecting one or both of the hind legs, and sometimes a fore leg. It is usually caused by idleness and rich food, but when seen in animals in poor condition, the disease is often caused by the blood being in a highly fibrinous condition.

Following a day or two of rest, the disease is ushered in by a shivering fit, and lameness appears in the affected limb. A hot stage now succeeds, the animal blows and sweats, the bowels are constipated and the urine scanty and highly coloured. The leg affected is very tender to the touch, and swelling commences and increases till it involves the whole leg, while the acute pain and lameness to some extent subside. Some horses are predisposed to the disease, and repeated attacks usually terminate in a chronic and incurable enlarged condition of the limb called "Elephantiasis."

Give a purgative of six to ten drachms of aloes and two drachms ginger. Follow up with two-drachm doses of saltpetre night and morning. Bathe the affected leg long and often with hot water; exclude draughts, and, after bathing, apply camphorated liniment. When the lameness has disappeared, give regular exercise or work. Preventive treatment consists in reducing the grain ration, feeding bran, and giving some exercise when the horse that is predisposed to it is not working.

ODEMA OR SWELLING OF THE LEGS.

During the fall and winter months horse owners are frequently troubled by their horses swelling in the limbs particularly in the hind limbs. This indicates that some of the organs of digestion are not working properly, due probably to faulty teeth, a sluggish stomach, bad liver, intestines or kidneys. Such a condition is usually brought on by irregular feeding, bad feed or water, gloomy and filthy stables. Overwork, followed by idleness, may give rise to this trouble. Common sense will dictate that the cause be first removed. Examine the teeth, see that the food is of good quality, that the water is pure, that a change is allowed, and that he is fed regularly, and gets sufficient exercise. Be sure that the stable is in good sanitary condition. Some horses become subject to swelling of the legs, due to the fact that the first warning symptoms were treated with indifference. Such cases require treatment by a skilful veterinarian.

MANGE.

Mange, or scabies, is a skin disease caused by minute parasites. It is very contagious, and causes intense irritation, due to the poisonous secretion the parasites introduce into the tissues. The symptoms are more severe in cold, than in warm, weather. There is intense itching, accompanied by loss of hair, and later, an effusion, a thickening of the skin and the formation of scabs. As the disease advances, the thickened skin becomes corrugated in deep folds or ridges, especially where loosely attached to the tissues. The tremendous rate at which the parasites multiply makes the progress of the disease very rapid.

The animal must be clipped, the hair burned and the premises disinfected. Rub the body all over with soft soap, to which has been added about one per cent. creolin. This should be followed, after a lapse of a few hours, by a thorough dressing with the following preparation: Oil of tar, one part; raw linseed oil, twenty parts, to which should be added as much sublimated sulphur as the mixture will carry. The ingredients are to be heated gradually together, but must not be allowed to boil. The mixture should be rubbed into the skin, and

after several days washed off and the application repeated twice if necessary. Another preparation which can be used instead is: Sublimated sulphur, 200 parts; carbonate of potash, 100 parts; lard, 800 parts. Another effective mixture is creosote, 10 parts; alcohol, 10 parts; water, 25 parts.

ECZEMA.

Most of the skin diseases of horses may be said to be some form of eczema. Eczema simple is a non-contagious disease, due, in most cases, to local irritation or to some alteration in the condition of the blood. It usually appears suddenly, and is manifested by itchiness, while the hair and outer layer of skin become rubbed off, leaving the skin raw, red and inflamed. Successive crops of vesicles develop, dry on the sore skin, or discharge a fluid which appears to cause an extension of the disorder. It is generally called mange, but differs vastly from mange, in being non-contagious and not being due to a parasite. The head, neck and shoulders are the favorite seats, but it may attack all or any parts.

Give a purgative of six to ten drachms of aloes and two drachms of ginger. Follow up with one ounce of Fowler's solution of arsenic night and morning, every alternate week, as long as necessary. Give the body a thorough washing with strong, hot soapsuds, applied with a scrubbing brush. If the season is favourable, clip the horse. Follow up by dressing, twice daily, with a lotion of 30 grains corrosive sublimate to a quart of water.

ERYTHEMA.

Erythema, or inflammation of the outer layer of the true skin, is due to changing temperatures affecting the skin, to wet friction, or constitutional causes, including hereditary predisposition. The disease is characterized by redness (not noticeable except in white-legged horses), with heat, swelling, irritation and eruptions. When the heels are affected, it is called Scratches or Grease Heels; when the greater part of the hind leg, Mud Fever; when the front of the hock, Sallanders; when the back of the knee, Mallanders. Pain, heat, tenderness, redness, and more or less swelling, are followed by sores or cracks. There is usually more or less lameness, especially when the horse begins to move, but it usually disappears on exercise.

Give a purgative of six to ten drachms aloes and two drachms ginger. Then give one ounce doses of Fowler's solution of arsenic, night and morning for a week. In the early stages, apply three times daily a lotion composed of an ounce each of sulphate of zinc and lead acetate to a pint of water; or oxide of zinc ointment, with good care, is all that is required. If the parts become muddy, do not wash, but rub off the mud when dry; if they get wet, rub with cloths until dry. If the cracks discharge a fœtid material, poultice with linseed meal and powdered charcoal for two or three days; then treat as above. If proud flesh appears, dress with butter of antimony applied with a feather once daily until it disappears. Keep the patient as dry and clean as possible.

SURFEIT OR NETTLE RASH.

Surfeit or Nettle Rash appears suddenly and is sometimes very alarming. It is due to some derangement of the digestive organs, often brought on by a sudden change of diet, overheating, or drinking heavily when heated. There is an eruption of elastic vesicules over a greater or less portion of the body, accompanied by intense itchiness.

Administer a purgative of six to eight drachms of aloes and two drachms of ginger. Wash the body well with warm, soft soapsuds applied with a scrubbing brush; rub until dry, and then apply a lotion composed of two ounces of sulphate of zinc, half an ounce of carbolic and one quart of water.

SIMPLE OPHTHALMIA.

Simple ophthalmia, or conjunctivitis, is an inflammation of the outer covering of the eye; caused by a blow, the bite of an insect, common cold, or a foreign substance in the eye. There is an intolerance of light, a swelling and partial or complete closure of the eyelids, and overflowing of the tears. The lining of the lids and the covering of the eye are congested and covered with red streaks. The eye, at first dim and blue-looking, becomes whitish in color.

If there is any foreign body in the eye, it must be removed. Place the animal in a comfortable box stall, and exclude the light. Give a laxative of, say, six drachms of aloes and two drachms of ginger. Feed on light, easily-digested food. Bathe the eye frequently with warm water, and, after bathing, put a few drops of saturated solution of boracic acid in distilled water into the eye with a dropper or feather. If a portion of the eye remains whitish and opaque after the inflammation has disappeared, this deposit of lymph may be removed by putting a few drops of a lotion, composed of five grains nitrate of silver in an ounce of distilled water, into the eye twice daily.

PERIODIC OR SPECIFIC OPHTHALMIA.

Periodic or specific ophthalmia, sometimes called moon blindness, is an affection acting primarily on the constitution and secondarily on the eye. The disease is hereditary in tendency, and after a few attacks, a cataract is formed, causing complete blindness.

The attack is sudden, and without apparent cause; the eye presenting a general appearance of inflammation. The dullness spreads from the margin to the centre, the pupil contracts, and the eye is intensely reddened. This is difficult to distinguish from the simple ophthalmia. The inflammation is not so acute as in the simple form, but will not as readily yield to treatment. The eye may regain its natural condition, but the attack may return any time, without apparent cause. The cataract may be detected as a whitish object situated well back in the eye. When this is complete, the animal is totally blind. Treatment similar to that for simple ophthalmia will hasten recovery from attack and retard the formation of cataract.

LAMINITIS OR FOUNDER.

Laminitis, or founder, is a very painful disease, consisting of inflammation of the sensitive laminæ of the foot, that part that is attached to the insensitive wall. It is caused by inordinate feeding, over-exertion, drinking cold water when overheated, long voyages or by being forced to stand for a long time in one position. Lameness is very marked, and the fore feet are more often affected than the hind. The animal stands with fore feet extended, and puts weight upon the heel, often sways backward raising the toes from the ground. If forced to back, he drags his heels on the floor. The feet are hot to the touch, the pulse full, the breathing labored, the bowels constipated, and in severe cases the animal sweats profusely. If the hind feet are diseased, he stands with all four feet well under the body, endeavouring to take all possible weight off the diseased

members. In some cases, all four feet are affected. Sometimes he will lie down and stretching out his legs experience great relief, while in other cases he persists in standing. In all cases the pain is distressing.

Treatment must be prompt and intelligent. If the case be neglected, a partial separation takes place between the sensitive and insensitive structures of the feet, the animal becoming more or less of a cripple. Remove the shoes, rasp the heels and soles well down, and apply hot poultices or stand in a tub of warm water. Administer a purgative of six to ten drachms of aloes and two drachms of ginger. Give ten to fifteen drops of Fleming's tincture of aconite in a little cold water every two hours until the pulse is reduced. Encourage the animal to lie down by placing him in a well-bedded box stall. In severe cases, it is well to cast him, when he will usually remain down as it gives so much ease. Continue to apply heat to the feet until the acute inflammation subsides; then apply a blister around the coronet. As soon as the acute lameness has disappeared, get him shod and give light work exercise on soft ground.

NAVICULAR DISEASE.

Navicular disease, or coffin joint lameness, is one of the most common causes of permanent lameness in the fore feet, and, if well established, is incurable. It is caused by standing too much on dry floors, irregular exercise, travelling on hard roads, or by leaving the shoes on too long. At first the lameness is very irregular, the horse becoming lame at times, then practically sound. After a time the lameness becomes marked and constant, the horse points his foot (or if both are affected, first one and then the other) while standing, stubs his toes, wears his shoes down at the toes, and suffers considerably, especially when first taken out. The lameness may disappear somewhat on exercise. The feet become narrow and contracted, and, after the bone and tendon become altered in structure, a cure cannot be affected.

To effect a cure, a long rest is necessary. Remove the shoes, stand in a tub of cold water during the day, and apply poultices at night until the inflammation is relieved. Then blister around the coronet as follows:—Take two drachms each of biniodide of mercury and cantharides and two ounces vaseline; mix. Clip the hair off all around the coronet for two inches in height. Rub the blister in well. Tie so that he cannot bite the part. In twenty-four hours, rub well again with the blister, and after another twenty-four hours, wash off and apply sweet oil. Now, turn him loose in a box stall, and oil every day until the scale comes off. Repeat the blistering once every month for four or five times, and have bar shoes put on.

SPLINT.

Splint, a common cause of lameness in young horses and occasionally in older ones, is caused by concussion, and consists in inflammation being set up between the large and small bones of the cannon, usually the fore cannon. An exudation is thrown out which becomes converted into bone, and long contact unites the two bones. When lameness is present, it is in the early stages; usually before any enlargement can be seen, and is marked only when the horse is urged to trot, the lameness increasing on exercise and on hard roads. An examination reveals tenderness upon pressure of the leg between the large and small cannon bones, usually on the inner side of the fore leg. The hind leg is rarely affected, but in that case the tenderness is more often found on the outer surface. After a time, there is a visible enlargement, which, in most cases, disappears in a few

months; though the union of the bones remains. Hence, a horse that has once had a splint will always have one, even though it is not visible. In most cases, a few days' rest and the application of cold water will effect a cure; if necessary, give a longer rest and apply a blister. An ordinary splint is not considered an unsoundness; but when large and close to the joint, or double, that is, involving both splint bones and showing on both sides, it is liable to cause lameness at any time and must be considered an unsoundness.

WOUNDS OF HORSES.

Wounds are classified as incised, punctured, lacerated, contused, gunshot and poisoned.

Incised wounds are those made by a clean-cutting instrument, where the bleeding is usually profuse.

This should first be arrested, by tying up the ends of the severed vessel, or vessels, with a silk thread. It may be necessary to enlarge the wound to do this; but if not possible, the wound may be plugged with batting soaked in a five per cent. solution of carbolic acid, the plug secured by stitching or otherwise and left in for eight or ten hours; then removed and the wound cleansed. All foreign bodies must be removed and the wound cleansed with warm water, then dressed with a five per cent. solution of carbolic acid, and the lips brought together by stitching with silk or catgut sutures. If these are not available sutures of saddlers' hemp, slightly waxed with beeswax, will answer. To protect the operator from injury, use a twitch and tie a fore foot up, or better, a hind foot forward. Put in a stitch every three-quarters of an inch, enclosing at least half an inch of skin on each side. Every stitch must be tied, in order to make it independent of the others. Leave the bottom of the wound open for drainage. It is good practice to give the patient a slight purgative of aloes or raw oil, and feed lightly. Keep the wound clean by sponging with warm water three times a day, then dressing with the carbolic lotion. Tie the animal so that he cannot bite or rub the parts. In about ten days cut the stitches out, but continue the dressing until entirely healed.

CONTUSED WOUNDS.

Contused wounds are injuries inflicted without actual cutting of the skin, such as blows from a blunt instrument. There may be rupture of a blood vessel and coagulation of blood, or a serous or purulent abscess may be formed.

If the contusion is slight, rest and bathing with hot water will suffice. If much blood is imprisoned; the sac must be lanced, the fluid allowed to escape, and the cavity flushed out with a five per cent. solution of carbolic acid until healed. When an abscess is likely to form, hot poultices should be applied, and when pus is formed, the abscess must be opened and treated as above. Give a slight purgative, say six drachms aloes, or a pint of raw linseed oil and let the animal have light food and rest.

SORE SHOULDERS.

Sore shoulders are usually the result of ill-fitting collars; but they may occur in cases where young horses, or those that have been idle for months, are put to work in hot weather. To prevent sore shoulders, the collar should not only fit well, but should be kept perfectly clean on the face. It should be removed during meal times, and the shoulders allowed to become cool and dry, and they should be well rubbed before the collar is put on again. With a young

horse, or a horse that has been idle for some time, the collar should be lifted frequently to allow the shoulders to become cool.

If there be simply inflammation, bathe the shoulder with water containing a little salt. When the shoulders become sore and raw, rest should be given. If this is not possible, the pressure should be minimized as much as possible by the use of sweat pads. Bathe the raw surface frequently with cold water and apply a lotion composed of one ounce each of sulphate of zinc and lead acetate, and four drachms of carbolic acid, mixed with a pint of water. If there are "sitfasts," i. e., portions of skin—the outer portion of which are detached—they must be removed with a knife, and the raw surface treated as above.

ENLARGEMENTS ON THE SHOULDERS.

Enlargements on the shoulders are common, particularly with farm horses. They are caused by hard work, especially with ill-fitting collars. When they appear suddenly, the enlargements are soft and fluctuating, not very sore to pressure and contain a bloody water (serum). These are serous abscesses. When they appear more slowly, are quite .ol: and hard, with possibly a soft spot in the centre, they contain pus and a .led purulent abscesses. Sometimes they have thick walls like solid tumc When without defined borders and fibrous in character th are called fibrous tumors.

The horse must have rest, and as in all such cases, he must be given a slight purgative and the diet must be restricted. If the enlargement be a serous abscess, make an opening at the lowest part large enough to admit the finger, so that all detached tissues may be removed. Flush out the cavity three times daily with a five per cent. solution of carbolic acid, or the ordinary white lotion, composed of one ounce each of sulphate of zinc and acetate of lead mixed with a pint of water. Keep the external wound open till the cavity is healed. If it be a purulent abscess, an opening must be made for the escape of pus and treated as above. If the enlargement be hard, look for pus with a probe. If pus is found, treat as above; but if no pus is present, it is a tumor and must be carefully dissected out, the wound stitched up, leaving a portion at the bottom for the escape of pus, and treat with carbolic or white lotion as for abscess.

POLL EVIL.

Poll Evil is a fistulous sore affecting the bones of the neck at the top of the head, caused by the chafing of a heavy halter or by blows on the top of the head. In the early stages there is a soft, fluctuating tumour witl ne stiffness of the neck, sometimes developing a running cancer.

Open the sore well up so as to get to the bottom, and make an incision deep enough at one side to allow the matter to run out. If the swelling is hard, poultice it; then lance and inject carbolic lotion, one part of acid to twenty of water. Put in a reton and dress with iodoform ointment. In obstinate cases, a piece of caust' potash, an inch or two in length, may be introduced into the opening and covered with oakum or cotton. Remove the caustic plug after twenty-four hours and apply hot fomentations.

PUNCTURES.

If a horse suddenly goes lame, a nail has probably punctured his feet. After removing the nail, if present, pare the sole at seat of puncture well down to the sensitive part. As this will remove any foreign matter there will be no danger of pus forming. Apply poultices now for two or three days, until the lameness

has disappeared. Then get the blacksmith to fill the hole with tar and tow and put a leather sole under the shoe to prevent the entrance of sand or gravel.

NAVEL AND JOINT DISEASE OF FOALS.

Hundreds of foals are lost every season through infection of the navel cord. The trouble may be prevented by taking the proper precautions in the stable. Filth germs enter the system of the young foal by way of the wide-open vein of the navel cord at birth and set up irritation where they enter, so that pus forms, causing an abscess from which secondary abscesses are produced in the joints of the extremities. The causative germs abound in all filthy places about the farm, but there are few, if any, in clean, disinfected, sunny, well-ventilated box stalls, such as should be provided for every mare at foaling time.

For prevention, the first step should be to provide a sanitary box stall. The floor of the box should be saturated with a solution of two ounces of sulphate of copper in a gallon of hot water; then clean bedding should be put in. The walls, first scrubbed and disinfected with a hot 1 to 50 solution of coal-tar disinfectant or other effective disinfecting substance, should be gone over with fresh-made lime wash, and when the mare has foaled and expelled her afterbirth, the bedding and afterbirth should be removed, the mare turned into another box previously made ready in the same way as the first, and then the latter should be disinfected and whitewashed as it was before the mare foaled. This plan, carefully followed out, will tend in itself to prevent infection of the navel, but to "make assurance doubly sure," the navel should be given special attention.

When the navel has been severed by rupture, or tied and cut, instantly wet it with a little of a 1 to 500 solution of corrosive sublimate, and repeat the application twice daily until the cord dries up, drops off and leaves no raw spot behind. If this cannot be done, use the disinfectant very thoroughly the first time; then paint the stump of the navel with a mixture of one drachm of iodoform in an ounce of flexible collodion, cover the navel with antiseptic cotton and put a wide bandage around the body to keep it in place. This treatment, besides preventing formation of an abscess in the navel and secondarily in one or more of the joints, will have a tendency to prevent scours, which also is a fatal disease of the new-born foal. It should be understood that all these precautions apply to the new-born calf as well.

SWAMP FEVER IN HORSES.

Swamp fever has caused considerable loss among horses in the Western States, particularly Kansas, and the disease is to some extent prevalent in Western Canada. It seems to be most prevalent during wet seasons, in low-lying, badly drained sections, and during the summer months. It is caused by an infectious bacillus, thought to be transmitted to healthy animals by an intermediate host such as flies, mosquitoes, and internal parasites.

About the first symptoms noticed are a general weakness of the animal, which tires very easily and is not able to do any work. The loss of flesh is apparent in spite of the voracious appetite which the animal has at times. The temperature is very irregular. Some days it runs quite high, at times to 107 degrees; again it is below normal. The blood becomes thin and the circulation impaired, and frequently there appears a swelling under the chest or abdomen or an enlargement of one or more legs. Death occurs in from 60 to 80 per cent. of the cases. Recovery takes place only when treatment is begun early and when the disease is not too acute.

Treatment is not satisfactory. Absolute rest until fully recovered is one of the primary requisites, and purgatives are to be avoided. For the fever give the following powder four times daily: Quinine 40 grains, acetanilid 2 drachms, and powdered nux vomica 30 grains. Cold water sponge baths and frequent copious rectal injections of cold water also aid in reducing the fever. After the fever subsides give half a teaspoonful of the following mixture at each feed: Arsenious acid, 9 grains; powdered nux vomica, 2 drachms; powdered cinchona bark, 6 drachms; powdered gentian root, 1 ounce.

As in the case of all other infectious diseases, the healthy should be separated from the sick horses, and thorough disinfection of the infected stable, stalls, litter, and stable utensils should be carried out in order to prevent the recurrence of the disease. As a disinfectant, carbolic acid or chloride of lime may be used by mixing six ounces of either of these chemicals with one gallon of water. The disinfectant solution should be applied liberally to all parts of the stable, and sufficient lime may be added to the solution to make the disinfectant area conspicuous. From the fact that the disease is more prevalent during wet seasons, it is always best to guard against allowing the animals to graze upon swampy lands or to drink from ponds of stagnant water.

DISEASES OF CATTLE

DRENCHING CATTLE.

The popular method of drenching is with a bottle. The use of a drenching tube, however, is safer and more satisfactory. A drenching tube may be made by taking an ordinary tin funnel, and inserting the narrow end into one end of a rubber tube or hose, say three feet long and one-half inch thick; into the other end of the tube is inserted a piece of three-eighths-inch brass or iron tubing, about four to six inches long. The metal tube is placed between the animal's back teeth, and the drench is poured into the funnel, which may be held by an assistant. The man who holds the metal tube between the animal's teeth can control its head with his left hand, and by holding the tube in the right hand, near the point of union of the rubber and metal tubes, he can easily control the flow of the liquid by pinching the rubber tube. Care must be taken not to hold the animal's nostril closed or the dose will enter the lungs.

IMPACTION OF THE RUMEN.

Impaction of the rumen is that condition in which the rumen becomes filled with large quantities of food which do not digest properly, nor yet form gases in large quantities. The organ becomes distended with food, and its walls more or less paralyzed. The appe[illegible]ls, rumination ceases, secretion of milk is checked, the animal is uneasy, [illegible]he rumen feels doughy to the touch and a dull sound is heard when it is [illegible]ed. In some cases, there are periods of apparent ease, in which the animal will eat; but no solid food should be given till the rumen is rid of its load.

This solid, undigested mass must be removed by purgatives. Give a drench of two pounds of Epsom salts, half an ounce of gamboge, and one ounce of

ginger in two quarts of warm water, and follow up with two-drachm doses of nux vomica three times daily. Allow nothing to eat but a little bran, and give water from which the chill has been removed. If the bowels do not act in twenty-four to thirty-six hours, repeat the purgation and continue with nux vomica. If bloating appears at any time, give two to four ounces oil of ·ntine in a pint of raw linseed oil. If the disease proves stubborn, the patient should be drenched with boiled flaxseed gruel to sustain strength.

When grain is the cause of the impaction and the animal becomes "grain-sick," the trouble becomes more serious. As soon as it is known that the animal has eaten too much grain, it is advisable to give the drench of salts, gamboge and ginger recommended above, which will usually cause purgation and avoid serious illness. If the animal has eaten very large quantities of grain and treatment is delayed, the contents of the rumen will have to be removed by hand and only a competent veterinarian can do this.

FARDEL-BOUND OR IMPACTION OF THE THIRD STOMACH.

Fardel-bound (maw-bound) consists in impaction of food between the leaves of the manyplies or third stomach. It is caused by the animal eating food of a dry, woody nature, such as over-ripe hay or grass of the previous year. It is a disease difficult to treat and often proves fatal. The first symptoms are often diarrhœa of short duration, followed by obstinate constipation and loss of appetite, while the secretion of milk is more or less suspended. The muzzle is dry, and the eyes generally dull, but sometimes wild-looking. A short grunt is generally emitted during expiration, especially when the animal is lying. In some cases, more or less delirium is noticed; in others, drowsiness and stupor or partial paralysis. After a time, bloating is noticed, from food fermenting in the rumen.

Give a brisk purgative of two pounds of Epsom salts, one ounce of powdered aloes and one ounce of ginger, dissolved in two quarts of warm water and given as a drench. Follow up with two-drachm doses of nux vomica three times daily. Give sloppy food and all the water she will drink. Make injections of soapy water per rectum every few hours. Unless there is full action of the bowels in from twenty-four to thirty-six hours, a pint of raw linseed oil should be given and a dose of Epsom salts, say, one pound, or a pint of oil should be given daily until the bowels move freely. In the meantime, continue the administration of nux vomica, and if the patient will not eat, she must be sustained by drenching with boiled flaxseed and ale.

TYMPANITIS OR BLOATING.

Tympanitis, bloating or hoven, as it is variously known, is a distended state of the rumen or first stomach, due to the production of gases from fermenting food. It is caused by over-eating, especially of food of a fermentable character, as fresh clover, turnip tops, or frozen grass. When the animal is affected feeding and rumination are suspended. There is a fulness of the left side, especially marked between the last rib and the point of the hip. If this is tapped it emits a resonant or tympanic sound; hence the name of the ailment. Breathing is more or less difficult, and there is often moaning and belching. In severe cases the breathing is very difficult, and unless relief is given promptly the animal dies from suffocation, rupture of the stomach or diaphragm, or from absorption of gases into the circulation.

If the bloating is not excessive, give two to four ounces oil of turpentine in a pint of raw linseed oil, and if necessary repeat the dose in an hour. Tie a gag or round stick in the mouth to keep it open and encourage the escape of gas through the gullet. If the bloating is excessive, there is but one sure remedy and that is to use the trocar and canula. The trocar is simply a sharp-pointed awl, and the canula is a sheath open at both ends, which is put on the awl. This is driven in with the awl, and remains when the trocar is removed, allowing the gas to escape. After the animal is relieved this is removed. If this instrument is not available, then take a clean knife and make the incision, put in a goose or turkey quill with both ends open, and hold it there till the gas escapes. The place to insert the trocar is on the left side in the centre of the depression between the last rib, the spine and the large, protruding bone. After the operation give the animal a dose of physic, say two pounds of Epsom salts in two quarts of warm water.

DIARRHŒA OR WHITE SCOURS IN CALVES.

Diarrhœa or indigestion, which is frequently called "white scours," in calves, is caused by neglect or improper treatment. The feeding of old or soured milk, irregular feeding, improper treatment of the dam (if the calf be sucking) are frequent causes; or it may be due to foreign bodies, such as hair balls or rags in the stomach. The white, watery discharge from the rectum distinguishes the trouble as "white scours." There is an irregular appetite, a swollen, tender abdomen—the calf becoming what is known as "pot-bellied."

The cause should first be ascertained. If a foreign body is suspected, give one to four ounces of castor oil, according to size. The addition to the milk of three or four ounces of lime water will usually affect a cure. This can be made by pouring a considerable quantity of water on a lump of lime, stirring briskly with a stick, allowing it to settle; the clear liquid on top being lime water. If the diarrhœa still continues, give one to three drachms laudanum, two to four drachms brandy, one to two drachms each of catechu and prepared chalk in a little new milk every two or three hours till the diarrhœa ceases. Then, feed on new milk and lime water. If calf will not eat, drench with linseed tea, to which a little lime water has been added.

SPORADIC OR ACCIDENTAL ABORTION.

Abortion is the expulsion of the fœtus from the uterus before it is sufficiently developed to live. Accidental abortion may be caused by a kick, a blow, a slip, violent exertion, excitement, unsanitary surroundings and such like. Especially during the early months of gestation, it may appear without any premonitory symptoms. In other cases, the symptoms are similar to those of approaching parturition at full term.

When abortion occurs suddenly, of course, nothing can be done to prevent it; but when premonitory symptoms are shown, it can, in many cases, be averted. The cow should be placed in a comfortable, quiet and partially-darkened box stall, and given two or three ounces of laudanum (tincture of opium) in a pint of cold water every two hours until the pains have passed off and she becomes tranquil. She should be kept quiet and fed on easily-digested food for a week longer. Even when the water bag has become visible, but not ruptured, this treatment often averts the accident, but if the water bag is ruptured, it is the duty of the obstetrist to assist delivery. A cow that aborts should not be bred

again for at least three months, and as a cow readily acquires the habit, she should be kept quiet, fed on light food, and carefully watched at about the period of gestation at which she aborted before.

INFECTIOUS ABORTION.

Infectious abortion is a very serious and very expensive matter to the breeder whose herd is affected. It is due to a specific germ that invades the generative organs. It is transmissable from female to female by contact, from female to male and vice versa, and from diseased to healthy animals by pails, blankets, hands or clothes of attendants, or anything that comes in contact with both. Abortion may occur at any period of gestation, and usually occurs without premonitory symptoms; the cow suffering no apparent inconvenience.

The measures taken must be energetic and thorough. Half measures are of no use. All pregnant cows not apparently affected should be removed to non-affected quarters. All aborted fœtuses and afterbirths should be burned, and the attendant of the diseased animals should not come near the healthy, without at least changing his clothing and disinfecting his hands. If an aborted cow does not expel the afterbirth, it should be removed. Some good disinfectant should be used in large quantities. Probably none have given better results than a solution of corrosive sublimate (bi-chloride of mercury) about forty grains to a gallon of water. It is well to make a barrelful of this solution, which should always be heated to about 100 degrees before using. A veterinarian's injection pump and a four-ounce syringe are needed. The wombs of all abortive cows should be flushed out once daily with about two gallons of the solution, introduced with the pump until the neck closes so that the nozzle of the pump will not enter, and, after that, a little should be injected into the vagina with the syringe until all discharge ceases. The external surfaces of the vulva and the tail and hind quarters should be bathed with the solution once daily. This latter treatment may be well adopted for all pregnant animals, in order to destroy any germs about to enter the genitals. The bull that has been bred to any of the diseased cows should not be bred again for two or three months, and, in the meantime, his sheath should be flushed out with the solution twice weekly, and when he is again bred, he should be flushed, both before and after service. All pregnant cows should be given forty to sixty drops carbolic acid in their feed twice daily. An aborted cow should not be bred for at least six months after abortion. When the disease appears to be stamped out, all loose articles that may be contaminated should be burned, and the stables thoroughly disinfected by burning sulphur in them after all openings are closed. Afterwards, spray with a five per cent. solution of crude carbolic acid, and a few days later, spray or wash with a hot lime wash and a five per cent. carbolic solution. If this disinfection has been thoroughly done, it will be safe to introduce healthy stock as soon as the premises are dry.

PARTURIENT APOPLEXY OR "MILK FEVER."

Parturient apoplexy, commonly but wrongly called "milk fever," usually attacks a cow from six hours to three days after parturition; but it has been known to appear several days later, and it may even occur preceding parturition. Its appearance is marked by the animal's restlessness, indifference to her calf and surrounding objects. The eyes look glassy, the pulse is suppressed, the temperature below normal, and the secretion of milk is more or less suspended. After a time she staggers, falls down and lies flat with legs stretched out, or on

the sternum with head turned round and nose resting on the flank. In most cases, she becomes unconscious, and if it were not for her sonorous respiration, one would think she was dead.

As the power of swallowing becomes impaired in the early stages, medicines must not be given in the ordinary way by the mouth. If any are given, they should be introduced directly into the stomach through a rubber tube passed down the gullet. The most modern treatment, however, consisting in inflating the udder with pure oxygen gas. For this treatment a tank of oxygen and a rubber tube, five or six feet long, with a teat syphon attached to one end are necessary. The udder must be thoroughly washed with a good antiseptic, as a five per cent. solution of creolin, and a rubber sheet placed between it and the floor. The udder must then be milked dry, the syphon disinfected and inserted into the teat, the other end attached to the tank and the cock turned, when the gas is forced into the quarters, each being filled to its utmost capacity. The cow usually revives and sits up on her sternum before the last quarter is filled. The udder should be well massaged until she regains her feet, which, in most cases, is in from one to six hours. Feed on sloppy food for two days. Do not milk at all for twenty-four hours after inflation, and do not milk dry for twenty-four hours longer; after which treat as if nothing had happened. If oxygen gas cannot be had, air sterilized, by being forced through aseptic cotton saturated with a five per cent. solution of carbolic acid, gives good results. If nothing better can be had, air may be pumped into the udder with a bicycle pump, but there is always danger of udder trouble following this treatment, and it is therefore unwise to adopt it if it is possible to secure proper apparatus.

RETENTION OF THE PLACENTA.

Retention of the placenta, or afterbirth, is of frequent occurrence in cows; but it has never been satisfactorily explained. There is usually a portion of the membranes observed hanging from the vulva. Cows have a fondness for eating the membrane, and this should be prevented, as untoward and sometimes fatal results follow.

If—in, at most, twenty-four hours in warm weather and forty-eight hours in cold weather—after parturition, a cow is not known to have expelled the membranes, they should be carefully removed by hand. The hand and arm must be thoroughly oiled with sweet, raw linseed, or other non-irritating oil; the hand introduced into the vulva and passed forward to the womb. If present, the membranes must be carefully separated from the lumps (cotyledons) with which the inner surface of the womb is covered, and care should be taken not to tear off any of these lumps. After all the membranes are removed, the womb should be flushed out with a warm two per cent. solution of creolin, and about thirty drops of carbolic acid given in soft food twice daily until all the discharge

INVERSION OF THE UTERUS.

Inversion of the uterus (womb) in cows occurs shortly after calving from relaxation of the ligaments that hold it in position. There is noticed protruding from the vulva a mass of tissues, the surface of which is studded with lumps (cotyledons) varying in size from one to three or four inches across.

Promptly remove any afterbirth, and bathe the ulcers well with hot water containing about five per cent. laudanum. If the cow will rise, get two assistants to suspend the organ with a sheet; but if she will not rise, it must be returned

while she is down. Return carefully, without lacerating, or tearing off any of the cotyledons. Arrange in as natural a position as possible; put three stitches in the vulva, and arrange a truss to prevent reinversion. Tie in a narrow stall, and build up the hind parts a foot higher than the fore, so that, standing or lying, she is low in front. Give laudanum in two-ounce doses to check straining. Leave truss on till straining ceases, say, two days longer.

BLOODY MILK.

When due to mammitis, bloody milk will cease when inflammation subsides. But a cow is occasionally noticed to give bloody milk from one or more quarters without apparent cause. When this occurs frequently in the same animal, it is due to a weakness in the blood vessels of the mammae, and while it may be successfully treated, its occurrence cannot be prevented. As such a cow is valuable neither as milker nor as a breeder, she is fit only for the block.

The animal should be fed lightly on dry food to check the secretion of milk. Bathe the affected parts long and often in cold water, and give one ounce of tincture of iron in a pint of cold water as a drench three times daily until blood ceases to flow. Milk regularly.

MAMMITIS.

Mammitis or inflammation of the udder, is more common in freshly calved cows, but may appear at any time from various causes, as irregular milking, direct injury, wading through cold water, draughts, etc. The first indication of mammitis noticed is swelling in one or more quarters of the udder which is hot and tender. The milk of the affected quarters is altered in character, in many cases practically consisting of curds and whey, and sometimes tainted with blood.

Treatment consists in giving a brisk purgative of two pounds of Epsom salts, half an ounce of gamboge, and three ounces of powdered ginger in two quarts of warm water, given as a drench. Follow up with three-drachm doses of saltpetre three times daily, and feed soft, light diet. Local treatment is important. Draw the fluid out of the teats every few hours and apply heat to the affected parts. Hot poultices are the best, but if these cannot be applied, bathe the udder long and often with hot water, and after each bathing rub well with camphorated oil, taking great care to exclude cold and draughts. Continue treatment until the inflammation subsides.

A complete cure does not always follow an attack of mammitis. After inflammatory action ceases, we frequently notice some of the following conditions:

1. Atrophy, or lessening of the gland. In this case the udder is small, flabby and more or less inactive. All that can be done is to feed the cow well on milk-producing food, massage the udder frequently, and milk at regular intervals. It is probable that she will not milk well until after the next calving.

2. Induration or enlargement and hardening of a portion of the udder. This is also hard to treat. Give the cow one drachm iodide of potash daily. If the appetite fails, if she slavers from the mouth and tears run from the eyes, reduce the dose to forty grains. Rub the hardened parts well daily with compound iodine treatment.

3. Suppuration, or the formation of abscesses is not uncommon. They must be lanced, the pus allowed to escape, and the cavity flushed out three times daily with a five per cent. solution of carbolic acid. In the meantime, give thirty drops carbolic acid in her mash twice a day until abscesses cease to form.

4. Gangrene mortification or death of one or more quarters may occur. Practically nothing can be done except to give tonics as drachm doses each of sulphate of iron and gentian, and antiseptics, as thirty drops carbolic acid three times daily. The affected portions may be removed with a knife. There is danger of this condition causing death.

INJURIES OF THE UDDER.

When a cow comes up from the pasture with one of her teats showing an ugly gash with ragged edges and coagulated blood, the first step should be to perfectly cleanse the injured part, using a warm 1 per cent. solution of coal tar disinfectant, or 1 in 2,000 solution of bichloride of mercury, easily prepared by dissolving druggists' bichloride tablets in water. At the same time all ragged edges should be trimmed smooth and all shreds and foreign bodies removed, to get the wound into good condition for the healing process which will be conducted by nature. When this has been done, the wound should not be stitched. Putting stitches in the lips of the wound simply makes a number of new wounds of small size, each of them likely to become infected.

Instead of using stitches, dust the wound with an antiseptic dressing powder such as a mixture of one drachm of iodoform and three drachms each of boracic acid and subnitrate of bismuth. In bandaging the teat, use surgeon's plaster Heat, to make it sticky; then wind evenly into place, turn after turn, commencing at the end of the teat and continuing up past the wound, until all of the teat has been covered and protected. The wound is now guarded against the entrance of germs; its edges are held together by the plaster; rest is insured and nature rapidly mends matters.

The teat may be handled as soon as the plaster has cooled off. At first the milk should be drawn off with a sterilized milking-tube, which has been boiled thoroughly and baked in a hot oven, but in two or three days milking can be done by hand without disturbing the bandage, and in ten days the plaster may be removed, and the wound then will, in most instances, be found healed.

Despite all that can be done, some torn wounds of the teat will, on healing, leave a pipe or sinus through which milk escapes at milking time. In simple cases, as for instance, where the pipe or "fistula," as it is properly termed, connects with a rudimentary milk gland or, in other words, has not been caused by an injury, a few coats of flexible collodion, applied as a varnish as required, will stop the milk flow at milking time, and when the cow is dry, the duct or fistula may easily be obliterated by cauterization with caustic, or the thermo-cautery, or even a red-hot knitting needle.

It is a much more difficult matter to close a fistula due to a barb-wire cut or similar injury, and the attempt should not be made while the cow is milking. When she has dried off, cleanse the parts thoroughly, then cut away the edges of the wound with a sharp, clean scalpel right down to a clean milking tube, previously introduced, and when this has been done, use dusting powder freely and at once bandage with surgeon's plaster. This treatment often proves effective, but in extra bad cases an expert surgeon should be employed to operate.

OBSTRUCTION OF THE MILK DUCT.

Obstruction of the milk duct from the growth of a small tumor in the duct is of frequent occurrence in cows. There seems to be a hereditary tendency in some families, a cow having one or more teats affected often producing heifers that will suffer from the same affection. These tumors appear without apparent

cases, and sometimes year after year, one teat and then another becoming affected. Thus, it is not wise to keep an affected cow for either milking or breeding purposes. In some cases, there is an entire stoppage, usually detected just after the cow has calved. In other cases, it appears more gradually, the teat becoming harder to milk, until no milk can be drawn. Upon careful manipulation between the thumb and finger a lump the size of a grain of wheat or larger can be felt. This lump may occur anywhere in the teat.

The success of treatment depends greatly upon the location of the tumor. The nearer the point of the teat, the greater the prospects of successful treatment. Instruments designed for the purpose either remove a portion of the tumor, or pierce it and fringe the edges of the opening. Unless a competent man with a trocar, or proper instrument can be secured to operate, it is better to carefully introduce a teat syphon to draw off the milk occasionally and allow the quarter to become inactive.

COW POX.

Cow pox is contagious, and as the germs may be readily transmitted to healthy animals by any means of contact, great care is needed to prevent its spread. The first symptoms are slight swellings on teats or udder, or both, with redness, at first diffused, but becoming more circumscribed. Small nodules appear, followed by little blisters, usually compressed at the centre and with a bluish tinge. Then pus is formed, which either escapes by rupture or becomes absorbed and a brown scab forms. This remains for some time, and if removed will reappear. The milk, which is unfit for use, must be regularly drawn off. If necessary use a teat syphon, as for sore teats. Dress the parts three times daily with an ointment of four drachms boracic acid, twenty drops carbolic acid, and two ounces vaseline, until cured.

SORE TEATS.

Sore teats are caused by carelessness or roughness on the part of the milker, by forcible traction by the calf, sudden changes of temperature, or scratches. The teat must be kept clean, but should not be washed in cold weather, as the reaction from warm water to cold air aggravates any soreness of the teat. If there is much difficulty in milking use a teat syphon. Dress the sores three times a day with a soothing application, as three per cent. carbolic acid in sweet oil, or the oxide of zinc ointment. Use the syphon only until the cow will allow you to milk by hand. The syphon should be disinfected by boiling water and a solution of carbolic or creolin between milkings.

RINGWORM.

Ringworm is caused by a vegetable parasite and is contagious. It appears in round, bald spots, usually about the eyes, face and neck. The patches are itchy, covered with whitish scales and surrounded by a ring of bristly, broken hairs with scales around the roots. The spots usually multiply rapidly.

The diseased animals must first be removed, no intercourse allowed with the healthy. Soften the scales with sweet oil and remove them, then apply a dressing that will remove the parasites—tincture of iodine, mixed with an ointment made of one part of white hellebore to four parts vaseline. A five per cent. solution of carbolic acid or creolin, one part corrosive sublimate to 250 parts water, or any other good insecticide, applied daily, for a week or so, will effect a cure.

To make the work effective, the premises must be disinfected by washing thoroughly with a five per cent solution of carbolic acid, and afterwards giving a thorough coating of hot lime wash, with five per cent. carbolic acid, before introducing fresh stock.

WARTS.

Warts may appear anywhere on the animal. They may be flat or they may have constricted necks, and they may disappear without treatment.

When the warts are small and numerous, the daily application of castor oil appears to hasten their disappearance, but those with constricted necks should be removed by the knife and the raw surfaces dressed with butter of antimony or other caustic, and the corroded parts picked off occasionally until they disappear.

FOUL OF THE FEET.

The most fruitful cause of foul in the feet is the irritation caused by walking through such substances as liquid manure, rushes or low marshy ground, but it may be caused by overgrowth of horn or by injuries. Inflammation results, followed sometimes by suppuration and rawness between the hoofs, while the animal is lame, usually on the hind feet, and the coronets may possibly be sore.

Place the animal in a dry clean stall, wash out between the hoofs and apply a poultice of warm linseed meal, change the poultice every eight hours until the soreness begins to subside, then dress with a cooling lotion, as one ounce sulphate of zinc to a pint of water. If the disease has been of long standing and sores with proud flesh are present, apply a little of equal parts butter of antimony and tincture of myrrh with a feather once daily for three days when changing poultices. Then dress three times daily with carbolic acid, one part; sweet oil, twenty parts.

CHOKING.

There is no ailment of cattle in which irrational treatment causes death in so many cases as in choking. In some cases, attempts to dislodge the obstacle are made by passing some such instrument as a whip or broom handle down the animal's throat with the idea of dislodging the obstruction and forcing it down to the stomach. This sometimes succeeds, but in many cases the instrument passes alongside the obstruction and ruptures the gullet. The operator thinks he has succeeded in dislodging the obstruction, but the neck and throat of the patient soon begin to swell, it cannot eat and drink, and in a few days, dies. A post mortem reveals a ruptured gullet, and in most cases the obstruction still in it.

If the obstruction is of the throat or region of the neck, it can be located, but if in the thoracic portion of the gullet, it cannot be felt. The cartilagenous box at the commencement of the wind-pipe must not be mistaken for the foreign body. If in the throat, place a clevis in the mouth to keep it open, and take out the obstruction with the hand. If in the neck, try to remove it by manipulation. If this cannot be done, pour a little oil down the gullet, and coughing will probably dislodge the obstruction down. The proper instrument is a probang, a flexible tube with a cup-shaped disk on the end that will grasp the object in its cavity instead of slipping alongside. A gag, consisting of a piece of wood about 2½ inches wide, with a hole in the centre for the probang to pass through, must be kept in the mouth. Where a probang cannot be procured a piece of ordinary

inch width garden hose answers the purpose. Apply steady, but, if necessary, considerable force. If bloating be excessive, it is sometimes necessary to puncture the rumen and allow the gas to escape, before attempting to use the probang, for the pressure of gas from the stomach forcing up the gullet may be greater than can be overcome. If these means fail, a veterinarian must be secured immediately, to cut down on the obstruction and remove it.

LUMP-JAW OR ACTINOMYCOSIS.

Actinomycosis or lump-jaw is an affection of the soft tissues and bone caused by the entrance into the circulation, through an abrasion, of a specific fungus. This causes a tumor to form usually in the region of the face, jaws or throat, but frequently in other tissues. In a large percentage of cases, the bones of the jaw are invaded, and greatly enlarged. In many cases, there is a discharge of a dirty-looking pus, but sometimes there are no eruptions. If the tumors become large enough to interfere with the functions of any vital organ, or the bone becomes sufficiently diseased to cause a loosening of the teeth, the animal's thriftiness will be impaired. Neither the meat nor the milk of any diseased animal is considered healthy, and any person who offers either for sale is liable to prosecution.

In some cases, the tongue is the seat of disease, when it is called "Wooden Tongue." The organ becomes enlarged and hardened, the animal salivates a great deal, cannot prehend as usual with the tongue.

In cases where the soft tissues only are involved, the tumor can be carefully dissected out, the wound stitched and dressed with a 5 per cent. solution of carbolic acid until healed. The "Iodide of Potassium Treatment," when resorted to at a reasonably early stage, will effect a cure. This treatment consists in giving the animal iodide of potassium three times daily until iodism or poisoning by iodine is produced. Commence by giving drachm doses and increase the size of the dose daily, say to 70 grain doses the second day, 80 the third, 90 the fourth, until the appetite fails, the animal drinks little, tears run from the eyes and saliva from the mouth. As these symptoms indicate iodism, administration of the drug must now cease. If necessary, the animal may be treated again in six or eight weeks.

DISEASES OF SHEEP

GRUBS IN THE HEAD.

Grubs in the head cause the death of many sheep every year. They are caused by the sheep gadfly depositing its larvæ in the nostrils of the sheep. These larvæ make their way up the nostrils and through the little openings into the sinuses or cavities of the head, attach themselves to the mucous membrane and remain there and develop. During the early spring months the sheep affected are noticed to be uneasy, shaking their heads and sneezing. There is usually a discharge from the nostrils, at first watery, but soon becoming purulent. These symptoms increase in severity, the patients lose appetite, cough or sneeze a great deal and become emaciated. In some cases a violent sneezing dislodges the grubs and the patient gets better. In others the grubs die and

remain in the sinuses, but the sheep do not thrive well, although continuing to live.

Trephining, that is, boring a hole into the sinus, and removing the grubs has been attempted, but has rarely been successful. The flies may be prevented from depositing their eggs, however, by smearing twice weekly the lips and nostrils of the sheep with tar mixed with salt during the months in which the flies prevail—July and August and the first half of September.

CATARRH.

Catarrh occurs in sheep that have been exposed to wet and cold. There is depression and loss of appetite. The lining membrane of the nostrils is red and inflamed, and there is at first a thin and watery discharge, which becomes thick and purulent and sometimes tinged with blood. The eyes are half closed and the lids often gummed together with a yellow secretion. Death follows rapid prostration and emaciation.

Remove the sheep to dry, comfortable and well-ventilated quarters. If the bowels are costive, give four to six ounces of raw linseed oil. If the sheep will not eat anything, drench carefully every three or four hours with boiled linseed oil or new milk and eggs to which has been added one or two ounces of whisky. Give saltpetre four times daily by placing one drachm well back on the tongue with a spoon. Steam the nostrils twice a day over a pot of boiling water, to which has been added a teaspoonful of carbolic acid.

WOOL BALLS IN THE STOMACHS OF LAMBS.

Many lambs, especially early ones, die suddenly every year, and the owner is at a loss to find out the cause. A careful post-mortem will often reveal one or more balls of wool in the fourth stomach, and in some cases a ball is firmly impacted in the pylorus (the opening from the stomach to the small intestine) which causes immediate death. In other causes, the ball may stop the passage, and is shifted again, when the animal becomes easy. This may go on for months, the lamb being unthrifty and eventually dying. The trouble is caused by the insufficiency of the ewe's milk, the little ones sucking the wool, and swallowing a few fibres, which collect in a ball in the fourth stomach.

This trouble cannot be cured. The only way of preventing it is to see that the lambs get sufficient nourishment. If the ewe has not enough milk, cow's milk should be substituted. As soon as the lambs will eat they should be supplied with finely pulped roots placed in a corner and so arranged that the ewes cannot reach them. Shearing the wool of the udder and surrounding parts acts as a partial preventive.

APOPLEXY.

Cerebral apoplexy is not uncommon in sheep that are highly fed, kept in warm quarters and get little exercise. The sheep appears dull, the nostrils and pupils are dilated and the breathing is noisy and difficult. In some cases the animal will leap into the air, fall, and unless promptly relieved, will die in a few minutes.

As soon as the first symptoms are noticed, purge with four to eight ounces raw linseed oil. Repeat in six hours, if necessary. Place in cool dry quarters, feed lightly, and see that the patient gets sufficient exercise. If the symptoms are alarming she must be bled from the jugular vein, one or two pints of blood being drawn to relieve at once the congestion of the brain.

TAPE WORM.

Tape worm is quite common in sheep. They become infected with the parasite while pasturing or drinking where dogs have scattered the eggs. When the parasites are present in large numbers, the lambs, yearling or two-years-old, become unthrifty. In some cases, sections of the worm will be noticed in the droppings. The animal eventually dies from emaciation, and a post-mortem reveals the parasites present in the intestines in almost incredible numbers and lengths.

The sheep should be kept off infected soils, or where dogs are accustomed to run. Curative treatment is usually disappointing. A decoction made by breaking pumpkin seeds, adding water, bringing to a boil in a pot on the stove, simmering for five or six hours, and pouring off the liquid, has given fair satisfaction. The sheep must be fasted for twelve to fourteen hours, and then the product of two to four ounces of the seeds, according to size of patient, is given to each. They should be kept in an enclosure and given nothing to eat for three or four hours after dosing. The droppings for the next fourteen to eighteen hours, which will generally contain considerable numbers of the parasites, should be gathered and burned. The flock should be treated this way once every two weeks until rid of the pest. A mixture of 14 parts new milk and one part oil of turpentine, well shaken together, acts nearly as well as the pumpkin seed and is much more easily prepared. The same mode of treatment is adopted.

SCAB.

Scab is produced by a parasite that burrows into the skin. There is extreme irritation, and a serum is seen to exude. This, in drying, forms the scab which brings the wool away with it in larger or smaller patches. The disease is very contagious, and the insect is very tenacious of life. It is said to have remained in a pasture for two years and then spread the disease.

The Government demands that the Veterinary Department be at once notified when any suspicion of scab exists, and a Government inspector is sent to take charge of the cases, and quarantine the district. All affected sheep, and those that have been exposed to the contagion, must be isolated and treated every ten days with some sheep dip until the disease is stamped out.

FOOT ROT.

Foot rot is a contagious disease that infects sheep grazing on the same pasture as affected animals, by means of the discharge from the latter adhering to the grass. The sheep become lame, and the skin around the coronet red, warm and rough. Soon there is a discharge, ulcers are formed, and the disease penetrating into the interior of the foot, separates the sensitive and unsensitive potions. The sheep will often be noticed walking on their knees while grazing.

All those affected must be isolated, and the others removed to non-affected pastures. Keep the diseased in clean, dry quarters, cut away all partially detached horn, and dress the ulcerated portions with equal parts butter of antimony and tincture of myrrh applied with a feather once daily until all proud flesh has disappeared. Then dress three times daily with carbolic acid, one part; sweet oil, twenty parts. If large numbers are diseased, a trough containing a solution of copper, about one grain to a quart of water, can be arranged through which they can be driven every few days instead of dressing each with a feather.

DISEASES IN SWINE

CRIPPLING.

Crippling, like many of the non-contagious diseases of swine, is caused by high feeding and want of exercise. The pigs are noticed to go stiff or lame in one or more limbs, usually the hind limbs. The animal lies most of the time, the lameness becoming more and more marked; sometimes he will drag his hind quarters when going to the trough for food. At last he becomes a perfect cripple, unable even to drag himself around. He loses his appetite and he either dies, or, if nursed and fed, continues to live for a greater or less time. In many cases, one after another show like symptoms, and the owner often thinks it is a contagious disease, but the same causes are operating in all.

Preventive treatment consists in allowing or forcing regular exercise, and giving liberal allowances of green food, or in winter, raw roots. If exercise is not possible, keep the bowels loose by feeding daily a little of a mixture of equal parts sulphur, Epsom salts and charcoal. Curative treatment consists in purging with two to six ounces Epson salts on the first appearance of the symptoms. Repeat in twelve or fifteen hours if the dose does not act. Feed lightly, and give some of the above mixture in the food every day. Give plenty raw roots, or grass if in season, and force exercise. Great care must be taken in drenching a pig, as there is danger of causing choking. The safest way is to put the solution into a bottle; get about six inches of rubber hose, force one end over the neck of the bottle; get a rope in the patient's mouth just behind the tusks, and have it held high enough to slightly elevate the pig's head; put the hose into the side of his mouth and elevate the bottle. The pig will chew the rubber, and at the same time extract the fluid from the bottle and swallow it without danger.

THUMPS.

Thumps is another abnormal condition caused by high feeding and want of exercise. The animal is dull, constipated, lies down a good deal, breathes short and frequent, and makes a peculiar thumping noise, hence the name.

Give two to six ounces Epsom salts, according to size, taking especial care in drenching him. It is well to give injections of soapy water, per rectum. Feed small quantities of easily digested food, and give enough of equal parts sulphur, charcoal and Epsom salts daily to keep the bowels loose. If necessary, force him to take daily exercise.

BRONCHITIS.

A form of bronchitis that in many cases appears to be of contagious nature appears in hogs that are housed in damp, dirty, confined quarters. Once it has appeared in a herd, it is very hard to check, even though the quarters be changed. Those attacked cough or sneeze occasionally, the coughing later becoming more frequent and the appetite is impaired. The symptoms increase in severity, the patient fails and eventually dies, while in the meantime others are showing symptoms. Sometimes there are chronic cases, in which the symptoms remain about the same, and strongly resemble those of swine plague.

All that show acute symptoms should be destroyed, and the carcasses buried deep and covered with quicklime before earth is thrown on. All openings of the building should then be closed and sulphur burned as long as the attendant

can stand it, the pigs thus being forced to inhale the fumes. When the attendant cannot stand it any longer, admit fresh air through all the openings. This treatment should be repeated every ten days, as long as necessary. When the disease has been stamped out, thoroughly disinfect the premises and allow to stand empty a few weeks before introducing fresh stock.

To disinfect, sweep thoroughly, then apply a five per cent. solution of crude carbolic acid to all parts with a brush or preferably a spray pump. In a week give a thorough coat of hot lime wash with five per cent. crude carbolic acid, and after another week repeat.

DIARRHŒA IN YOUNG PIGS.

Diarrhœa, so common in young pigs, is usually due to some abnormal condition of the sow's milk, and treatment must be directed towards rectifying this. The sow should be given good nourishing food, of which grain forms the largest part. A mixture of equal parts of powdered charcoal and salt should be placed where both the sow and pigs can take it at will. For a tonic, mix one pound each of powdered aniseed, chalk and gentian and four ounces bicarbonate of soda and give a tablespoonful to the sow in each feed.

INVERSION OF THE RECTUM.

Inversion of the rectum in swine is caused by opposite conditions, that is, either constipation or diarrhœa. In the former case the intestine protrudes as the result of excessive straining in an endeavour to expel the contents of the impacted bowels, and in the latter from excessive straining due to irritation of the intestines.

As treatment is often unsatisfactory, the bowels should always be kept in a normal condition by proper feeding and environment. When the condition is due to constipation, curative treatment consists in removing all the fæces that can be reached with the finger and by injections of raw linseed oil. Wash the protruded intestine well with warm water, apply strong alum water (as much powdered alum as warm water will dissolve), and carefully force back into position. Give the patient a laxative of two to six ounces of raw linseed oil, according to size, and feed on easily digested, laxative food. Remove the contents of the rectum with the finger every few hours, and then inject a little of the alum water. If diarrhœa be the cause of the trouble, the local treatment to the protruded intestine should be the same as the above, but feed on dry chopped grain and give one to four drachms each of laudanum and powdered catechu in a little cold water as a drench every three or four hours till diarrhœa ceases.

HOG LICE.

Coal oil is sure death to every louse it touches, but does not always kill the eggs, and must be used with caution to prevent blistering the skin of the hog. When a large drove is treated, the work can be done very quickly by using a spray pump having an attachment for mixing the oil and water, and the pump should be so that it will use about five parts of water to one part of oil. When such a mixture is thrown over the hogs in a fine spray, only a little of the oil is used to cover the whole animal, and if the spraying is done in the evening nearly all the oil will have evaporated by morning and there will be no blistering of the skin when the hogs are exposed to the hot sun on the following day. So little oil is used in the spraying that few of the eggs will be killed,

and the work should be repeated at the end of a week and again at the end of the second week. If the work is thoroughly done three sprayings will be sufficient.

QUINSY.

Quinsy or inflammation of the glands of the throat is caused by cold, draughts or dampness. The animal has difficulty in swallowing, his tongue usually protrudes, and the saliva flows freely, while there is usually a swelling of the lower jaw and neck. Treatment is difficult and not often successful. The animal must be cast, his mouth held open with some contrivance, as a small clevis, and the swollen glands scarified with a sharp knife until they bleed freely. As soon as blood flows, let him up for fear of suffocation. Apply to the neck cloths wrung out of hot water or rub well with mustard mixed with oil of turpentine, and tie flannel cloths around the throat. Swab the tonsils frequently with equal parts of oil of turpentine and sweet oil.

DISEASES OF DOGS

DISTEMPER.

Distemper is a disease to which the majority of dogs are subject. It is not, however, as is generally supposed, a necessary disease, as numbers of dogs never suffer from it in the slightest degree. It is more particularly a disease of youth, and is more frequent and fatal among highly-bred, pampered animals than those which live in a less artificial manner, and whose constitution is less modified by in-and-in breeding. A dog suffering from distemper shows, at first, catarrhal symptoms, and, as the disease develops, complications may follow, as pneumonia, jaundice, enteric disease, epilepsy, chorea or paralysis.

The symptoms are: A hot and dry nose, a disinclination for food, a watery discharge from the nose, frequent sneezing, followed by coughing and vomiting. The watery discharge soon becomes thick, containing pus, the eyelids become swollen and inflamed, and the breathing is accelerated. When the patient shows catarrhal symptoms and coughing takes place, give the following: Sweet spirits of nitre, four drachms; tincture of gentian, four drachms; peppermint water, one and one-half ounces. One teaspoonful three times a day for a terrier, and double the quantity for a large dog. To be given in the same quantity of linseed tea. Also give from one to two grains of quinine twice a day. It is most important that the discharge from the eyes and nose be carefully and frequently removed, else ulceration of the eyelids may follow.

When pneumonia sets in, hot linseed poultices should be applied. Internally, give, for a small dog, a teaspoonful of equal parts of brandy and water with two to four drops of chlorodyne every hour. Double the quantity for a grown-up terrier, and treble for a large dog. If there is danger of suffocation, emetics should be given until the patient has vomited. This form of the disease is easily told by the hot, rapid, gasping breath and an unmistakable mucous rattle, the sunken eye, jerking and increased heart beats and dilated nostrils. When the seat of the disease is in the bowels, a violent form of diarrhœa or dysentery sets in. The motions are dark, streaked with blood, and offensive.

A mild dose of castor or salad oil should be given, and in three hours give a teaspoonful of lime water in half a cup of scalded milk. Or give the following: Tannic acid, three to five grains; powdered opium, two grains; ginger, ten grains. To be given as a pill or powder. This dose is for a medium-sized dog. If the dog is very bad, apply hot linseed poultices to the abdomen.

CHOREA.

Chorea, or St. Vitus' dance, is purely a nervous affection, usually the result of an irritable or impaired condition of the nervous system. It may be general or local. The limbs are generally observed to be first affected, then the body, face and jaws. A dog suffering from chorea is noticed by a peculiar twitching and snatching of the parts. If the brain is affected, the head is in a continual spasmodic motion.

The usual treatment for this disease, local or general, is arsenic, in the form of Fowler's Solution. This is given one drop daily, increased drop by drop daily until the dose reaches ten drops, when it is stopped for a day, and the treatment begun once again. Or, iodide and bromide of potassium may be given, two drachms of each in four ounces of water, twice a day.

MANGE.

Mange is caused by a mite-like organism which burrows in the skin. There are two kinds of this parasite, the sarcoptic and the follicular. One of the characteristics of sarcoptic mange is the intense itching. The skin is covered with red points, like flea-bites, in the parts affected. These come to a head, break and discharge matter, which forms thick, dark crusts, which are ultimately cast off, leaving the parts hairless and of a bleached appearance. This disease rapidly extends over the body if not quickly checked. The simplest treatment is the application of a two per cent. solution of creolin sponged on twice a day. The following ointment is also very efficacious, and should be used after thoroughly washing the dog with soap and warm water: Sulphur, eight ounces; raw linseed oil, eight ounces; oil of tar, half an ounce; baking-soda, half an ounce. Mix thoroughly and rub well into the afflicted parts. Wash off and repeat in three days, and again after the same interval if necessary. Follicular mange defies treatment in a most persistent manner, the trouble being the difficulty experienced in reaching the acari, which burrow into the deeper layers of the skin and in the hair follicles. Treatment is somewhat troublesome and oftentimes unsatisfactory. Mercurial agents are, perhaps, the most useful. Use the following ointment: Acetic acid, two drachms; turpentine, two drachms; oil of tar, half an ounce; mercury ointment, one ounce; sulphur, eight ounces; whale oil, ten ounces. Mix well and rub into the affected parts for five minutes. Wash off in forty-eight hours with soft soap and warm water, and apply whale oil when the skin is dry; the following day repeat the ointment dressing as before. Allow a week to elapse before applying another dressing, should one be necessary.

FLEAS.

Fleas are one of the common pests of dog life. All dogs are more or less subject to them, and they are the indirect cause of a lot of mischief. The best method of ridding a short-haired dog of this pest is the following ointment: Oil of anise, one ounce; olive oil, ten ounces. Mix. Rub this well in, and wash off six hours afterwards. Give fresh pine shavings to lie on. For a long-

haired dog, use one part of stavesacre seed boiled for two hours in thirty parts of water. Before using, add water to make up for loss by evaporation, and sponge on once a day. A two per cent. solution of creolin, sponged on once a day, is also efficacious.

WORMS.

There are many kinds of worms which attack dogs, two of the commonest being the tapeworm and the round worm. Of the tapeworm there are many species, but the one which is more often found in dogs is the cucumerine tapeworm. This is a delicate and most transparent worm, measuring from ten to twenty inches. There are many methods recommended for expelling these worms from the intestines. One favorite is areca nut, thirty to sixty grains; another is turpentine, five to fifteen minims, in olive oil or milk. Another favorite remedy is pumpkin seeds chopped up fine, the dose of which is from half to one teaspoonful, and followed in two hours by a dose of castor or olive oil. Either of these should be given on an empty stomach. To make sure that the tapeworm has been removed, the excretions should be carefully examined for the head. If this cannot be found, the dose must be repeated, because, so long as the head remains, so long will the dog suffer.

Dogs when affected with worms are usually detected by their voracious appetite, their pot-bellied appearance after eating, spasmodic colic, irritation and impoverished state of the coat. Probably there is nothing better for the round worm than: Powdered areca nut, ten to fifteen grains; powdered rhubarb, five grains. Make into a pill with glycerine or lard. Give this pill two mornings in succession, on an empty stomach.

CANKER.

All dogs are liable to this malady, especially long-eared and water dogs. The disease can be divided into external and internal canker. External canker is that which attacks the edge or margin of the ear-flap, while internal canker is usually confined to the passage leading to the ear proper.

The symptoms of external canker are generally a repeated shaking of the head and flapping of the ears. Examination will show that the natural covering of the ear is red, puffy and hot. This is aggravated by the animal continuously scratching them. If this is not dealt with, the inflammation will give rise to a mattery discharge along the margin of the ears, and ulceration follows. The following is a useful lotion: Alum, five grains; vinegar, one drachm; water, one ounce. Apply twice or three times a day. One drachm of oxide of zinc to an ounce of vaseline may be used with benefit.

In internal canker the membrane lining the passage, as far as can be seen, is red and inflamed, and the root of the flap is hot and tender. There is the same shaking of the head as in external canker, and the animal often shows a disinclination to eat. As the disease develops, a dark, offensive discharge issues from the passage of the ear. The pain and itching is intolerable, the animal often rubbing his ears along the ground, scratching them, and uttering pitiful cries. The ears in this case should be gently syringed with warm water, then the following lotion poured into the ear, or some cotton wool saturated with it and packed in: Zinc sulphate, five grains, to one ounce of water. Apply three or four times a day. Or, wash out well with peroxide of hydrogen and dust in powdered boracic acid.

A FARM CALENDAR.

JANUARY JOTTINGS.

No better time to start bookkeeping than at the first of the New Year.

A cheap snow fence along the road will save shovelling.

Secure your field seeds without delay so as to have plenty of time for testing their vitality and removing weed seeds.

If doubtful about the quality of any seeds, send samples to the Seed Branch, Department of Agriculture, Ottawa, for analysis.

Drawing manure to the fields now will be good exercise for the horses, and lessens the early spring work.

January and February are the months of ice harvest, see that plenty is stored away for use in hot season.

Watch the cattle for lice, grubs, warbles, etc.

FEBRUARY FEATURES.

Make sure that the cows that will freshen soon are getting the proper fodder to produce strong calves and a liberal yield of milk.

A good currycomb is worth as much as a good meal to your live stock this time of year.

Early calves will require plenty of milk and a little meal before the grass comes.

Half a pound of grain per ewe, per day, for a month before lambing will do good to both lamb and dam.

If you contemplate planting new trees in your orchard this spring secure advice to suit your locality.

MARCH MEMOS.

Pruning, if not done in the fall, should be attended to early this month. See that the tools are sharp.

The country needs sugar. Get the sap buckets ready and make as much syrup or sugar as possible. It will pay well. Use a modern evaporator.

Disinfect and whitewash the poultry house this month.

Box stalls are the proper thing for cows and mares with young.

Cow's milk should not be used till after the ninth milking.

Up-to-date poultry men are preparing for an early hatch of chicks. What about an incubator?

It's time to start growth in the hot beds.

Keep the piglets warm if you want to raise them.

APRIL APPEALS.

What about farm drainage? Make careful note of the patches where growth is delayed through excess of water.

Time to take down the storm windows and doors.

Most farm fences require supervision and a little repair now.

Surface water can often be turned off a field with a shovel in half a day and get the land ready for seeding a week earlier.

Have you got all the information you need about spraying? You will certainly need to do the spraying.

See that surface water does not contaminate the domestic or stock water supply.

Don't let the stock in the orchard too soon.

Keep the disk harrow off the twitch grass.

MAY MOVEMENTS.

Have you got your bees out in the sunshine? They will soon be starting to work.

Do not plant any potatoes not warranted sound.

Spraying must be done exactly at the right time to be most effective. Study the spray calendar.

Lambs may be docked and sheep may soon be sheared. Watch for settled warm weather for this.

Get the strawberries planted early.

Hatching chickens should be completed this month.

Is the vegetable garden keeping pace with other work?

JUNE GINGER.

An annual pasture mixture is good insurance against a short grass crop.

Good time to dip the sheep for ticks and scab.

Corn requires ground heat for germination, hence should not be sown too early.

Now is the time to sow rape for August and September feeding.

Turnip and mangel seed should be secured early and ground well worked; but watch for best time to sow.

Strong attacks on field weeds should be made this month to check growth and prevent maturity.

Leave the colt in the stable if you have to work the mare.

Watch the weather during haying quite as carefully as in harvest. It has a lot to do with hay values.

JULY JOLTS.

Give the lambs a change of pasture and they will gain faster, but keep the ewes on short grass till milk flow is checked after weaning.

Watch milk temperatures. Cooling it means saving it, which means dollars and sense.

Bordeaux mixture applied regularly to potatoes after July 15 prevents late blight and rot.

Give the sheep another "dip," to kill the young vermin.

Hens that neither lay nor set should go to feed the harvest hands.

Is the new-forming manure pile properly protected?

Swat the fly before he is born by starving his mother.

AUGUST ADAGES.

"We eat all we can, and what we can't we 'can'," said a man in pre-war days. The practice still holds good.

Nitrate of soda around tomato plants helps to ripen them early.

Get fly repellants for the cows; helps milk flow.

It will pay to grade fruit and vegetables; then watch market reports for the best prices.

A weedless farm is the surest sign of good farming.

Are you preparing any exhibits for the fall fair? Time to start.

It pays to grow pure crops for seeding, pure stock for breeding, and clean feed for feeding.

A one-year-old queen bee is the best.

Disinfect the poultry house once more.

Be careful about feeding horses new grain.

Give working teams frequent drinks on hot days.

SEPTEMBER REMINDERS.

Co-operation is the slogan for farmers, both in winter and summer. Sell together, buy together, breed stock together, work together, prosper together.

Pack butter and eggs now and save money in winter.

Plan to get fall plowing done early and remember the weeds.

Experienced sheep breeders select their rams now.

This is the time to select seed corn and potatoes for next spring's planting. Choose early maturing, perfect samples, and get them properly cured.

Is the root house clean and properly ventilated?

Feed the surplus cockerels for early marketing.

Don't forget to leave ditches where needed on fall plowing. They will prove valuable after spring rains and thaws.

OCTOBER OBJECTIVES.

If you want lambs in March, put the ram with the ewes this month.

Examine the sheep for scab or vermin.

See that the silage is tramped down tight to prevent injurious fermentation.

Are the stables ready for the stock?

Prepare at once for the organization of Institutes or debating clubs and the arrangeme.. f programmes.

Keep the cows in nights.

Is the hen house ready for its winter boarders? If properly cared for they will be layers as well as feeders.

Put some one in charge of the poultry who will take an interest in them and make them pay. Plenty of light makes laying more prolific.

Now is the time to buy "feeders" if you have plenty of fodder.

Are hives and winter feed ready for put ing away the bees?

NOVEMBER NEEDS.

Many orchardists look over their trees and do part of their pruning, at least, this month.

How about the pig sty? It must be kept dry and as clean as possible; not necessarily heated.

Fall pigs may get rheumatism or be stunted if neglected.

Tramp snow around the apple trees or take other precautions to prevent girdling by mice.

Cold weather may give horses colic. Keep handy material for drench, as follows: 1½ oz. each of tinct. of laudanum, tinct. of belladonna, and sweet spirits of nitre; give in one pint of warm water.

Remove the old canes from the berry bushes.

Empty the hopper of the gasoline engine to protect batteries from frost.

DECEMBER DOCTRINES.

This is the month in which to renew your subscriptions to the "Family Herald and Weekly Star."

Ventilation, light and plenty of water are prime necessities for all stock in winter. Let the water not be too cold.

Let the colts out for a run. 'Twill do them good.

Idle horses should not get too liberal rations in winter.

Are the chickens getting a fair supply of green stuff?

Arrange to attend the farmers' meetings in your district and be prepared to give some information in return for what you get.

There will be plenty of indoor work if harness and machinery are properly cared for as well as stock.

Don't forget a little salt frequently for the stock.

Maybe the roots need picking over by this time.

INDEX

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